CS777

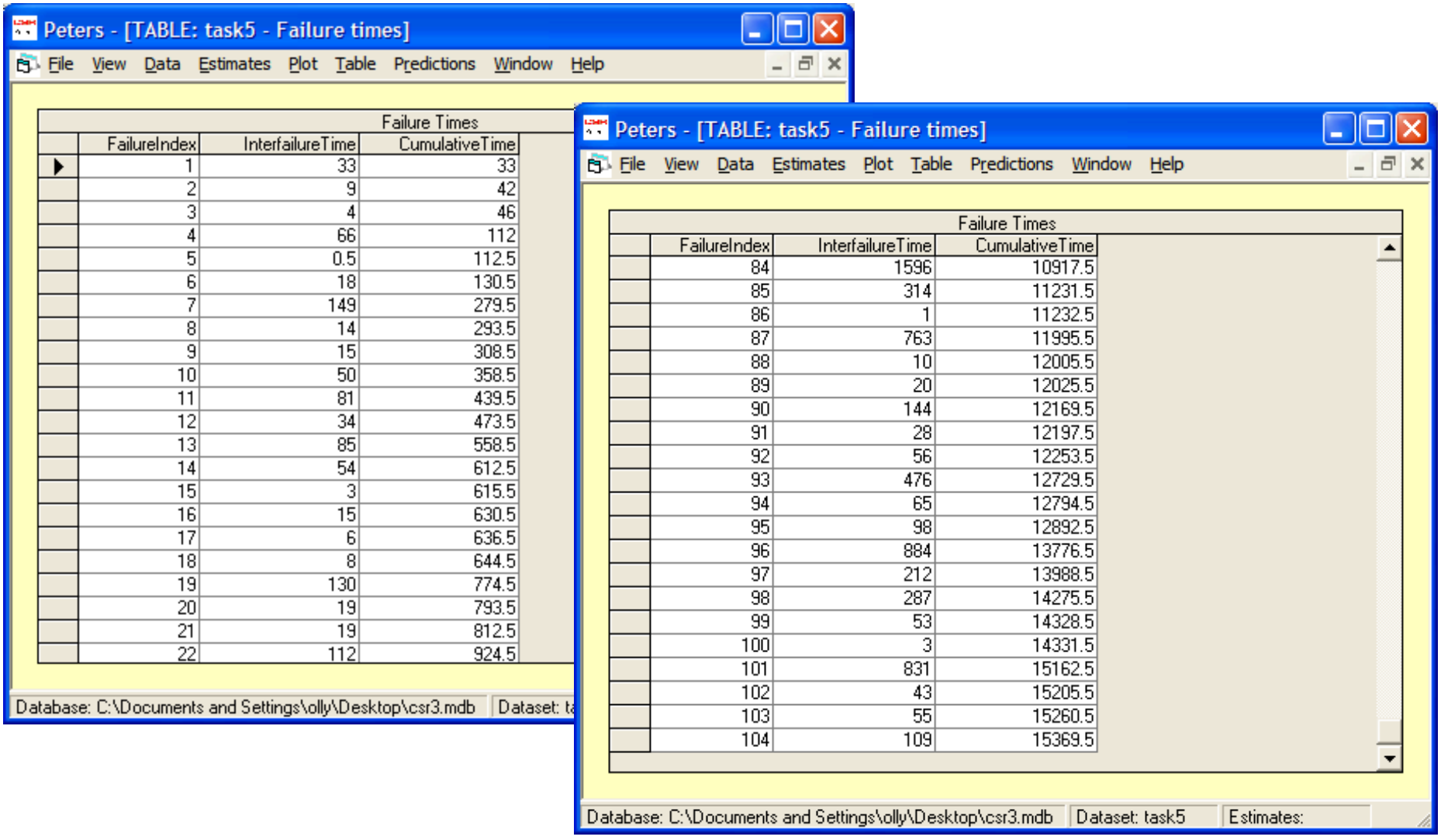
Another data set

CSR3

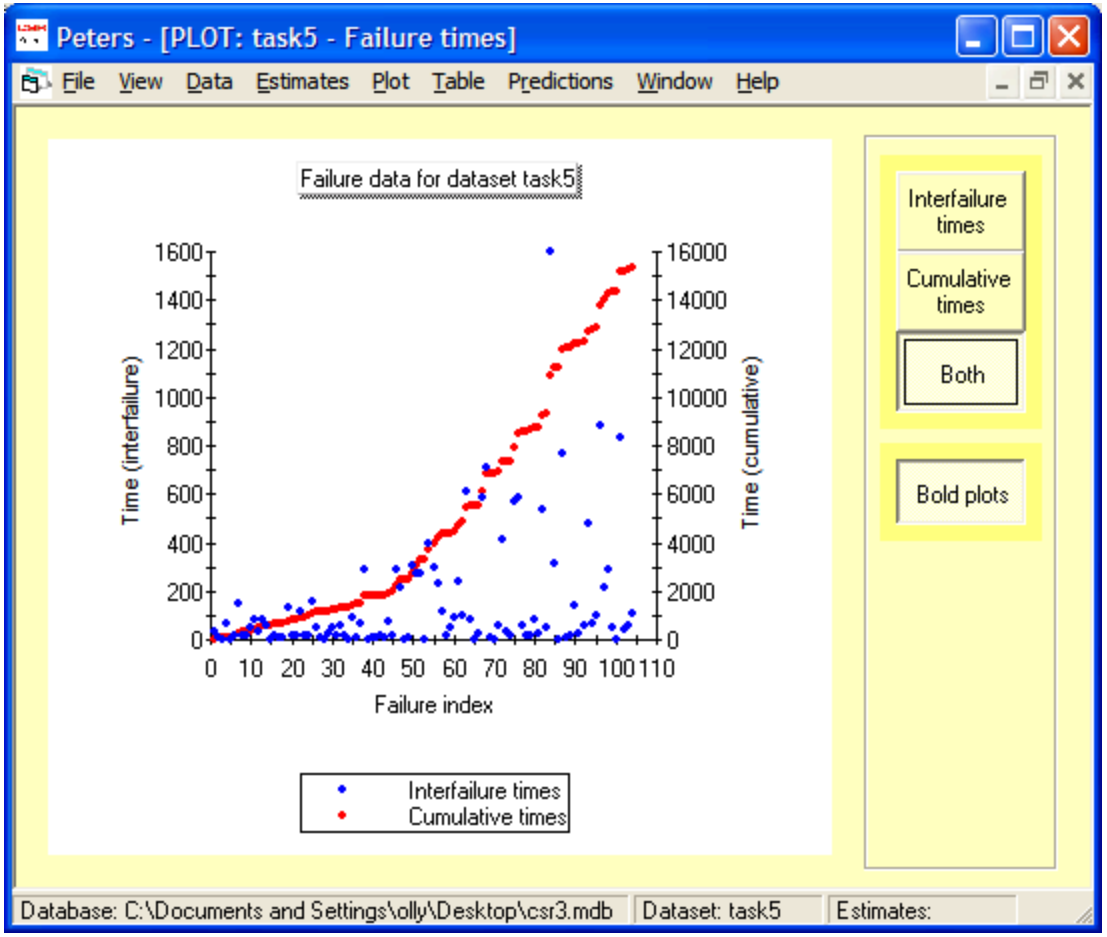
- Data Format: Time-between-failures data
- Column1: Failure Number
- Column2: Time-To-Failure
- 104 failures

- What is the data? (CSR1 and CSR2)

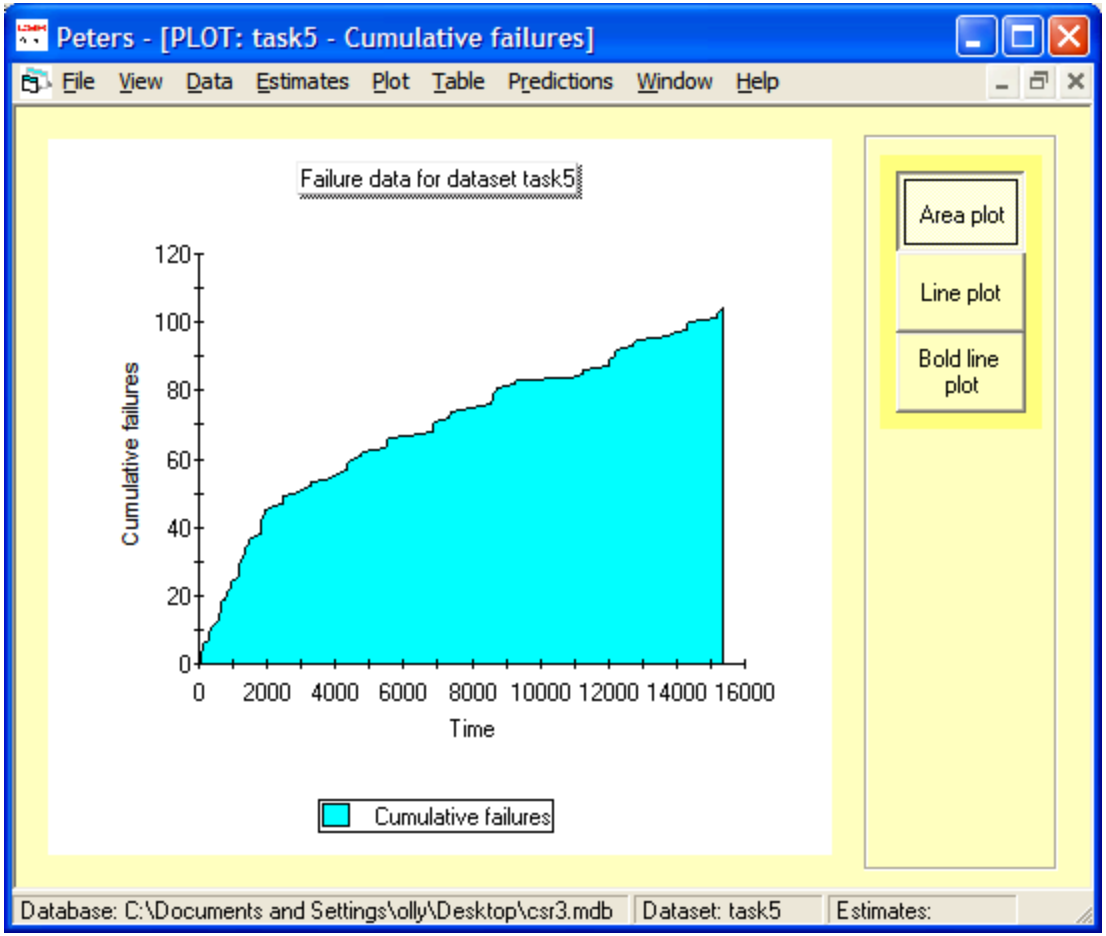
Raw Data


Peters - [TABLE: task5 - Failure times]
File View Data Estimates Plot Table Predictions Window Help
Failure Times
FailureIndex InterfailureTime CumulativeTime
1 33 33
2 9 42
3 4 46
4 66 112
5 0.5 112.5
6 18 130.5
7 149 279.5
8 14 293.5
9 15 308.5
10 50 358.5
11 81 439.5
12 34 473.5
13 85 558.5
14 54 612.5
15 3 615.5
16 15 630.5
17 6 636.5
18 8 644.5
19 130 774.5
20 19 793.5
21 19 812.5
22 112 924.5
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Peters - [TABLE: task5 - Failure times]
File View Data Estimates Plot Table Predictions Window Help
Failure Times
FailureIndex InterfailureTime CumulativeTime
84 1596 10917.5
85 314 11231.5
86 1 11232.5
87 763 11995.5
88 10 12005.5
89 20 12025.5
90 144 12169.5
91 28 12197.5
92 56 12253.5
93 476 12729.5
94 65 12794.5
95 98 12892.5
96 884 13776.5
97 212 13988.5
98 287 14275.5
99 53 14328.5
100 3 14331.5
101 831 15162.5
102 43 15205.5
103 55 15260.5
104 109 15369.5
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates:

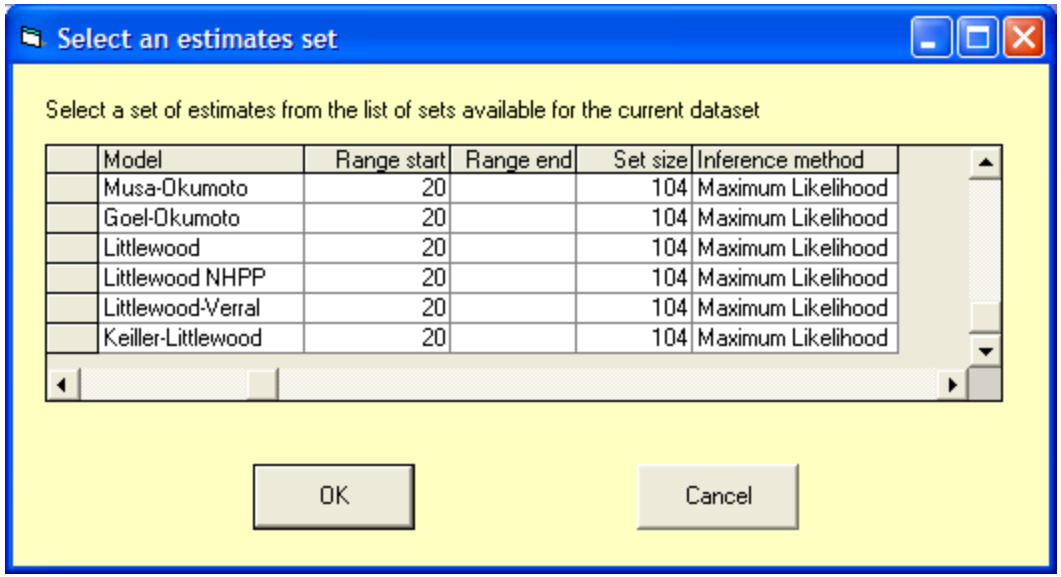
Raw Data Plots



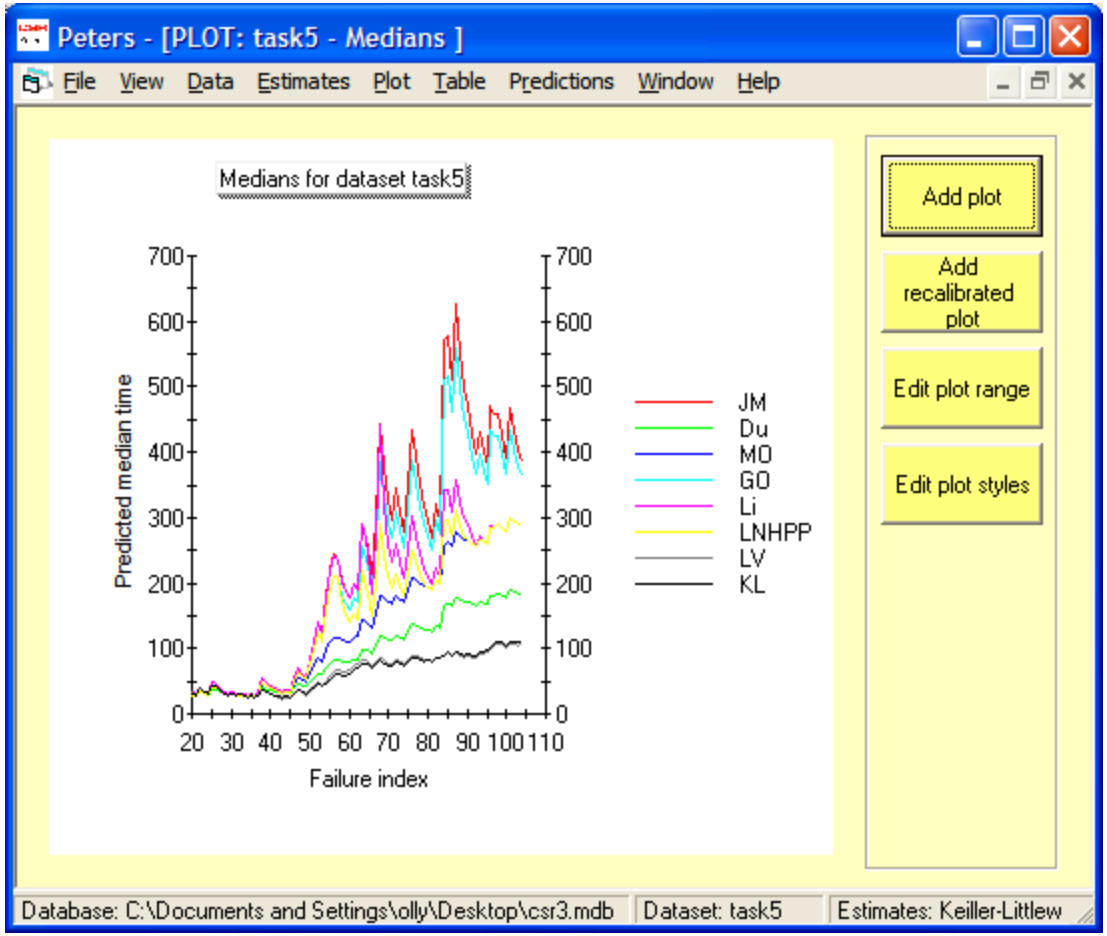
Cumulative


Peters - [PLOT: task5 - Cumulative failures]
File View Data Estimates Plot Table Predictions Window Help
Failure data for dataset task5
Cumulative failures
120
100
80
60
40
20
0
0 2000 4000 6000 8000 10000 12000 14000 16000
Time
Cumulative failures
Area plot
Line plot
Bold line plot
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates:

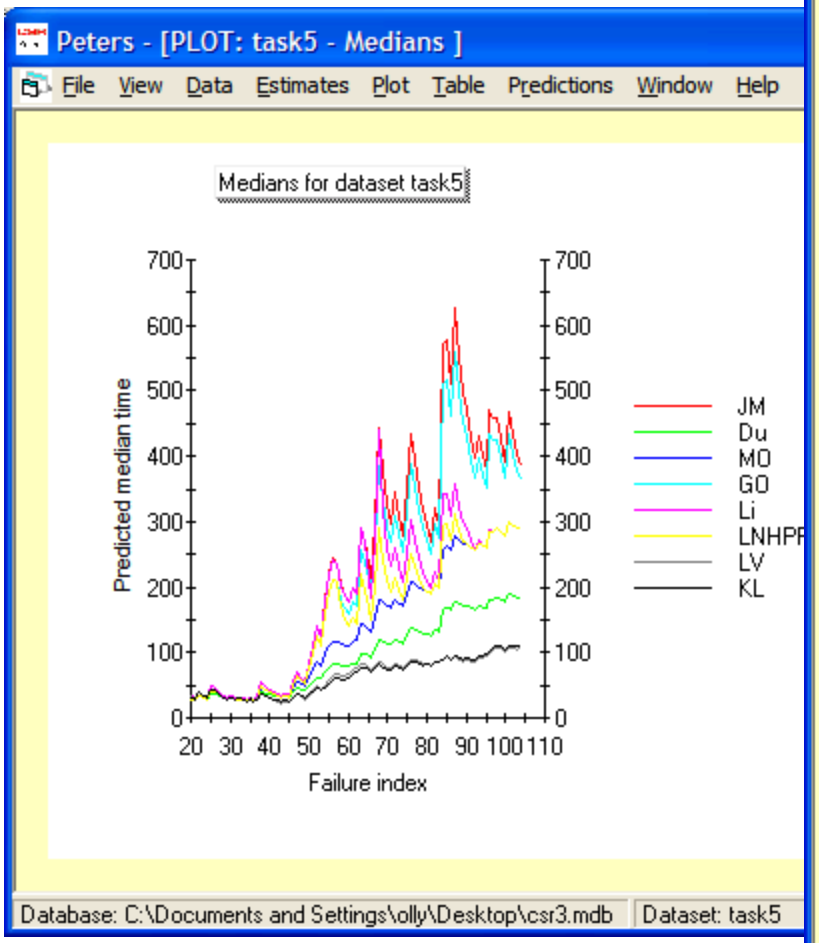
SRG Models

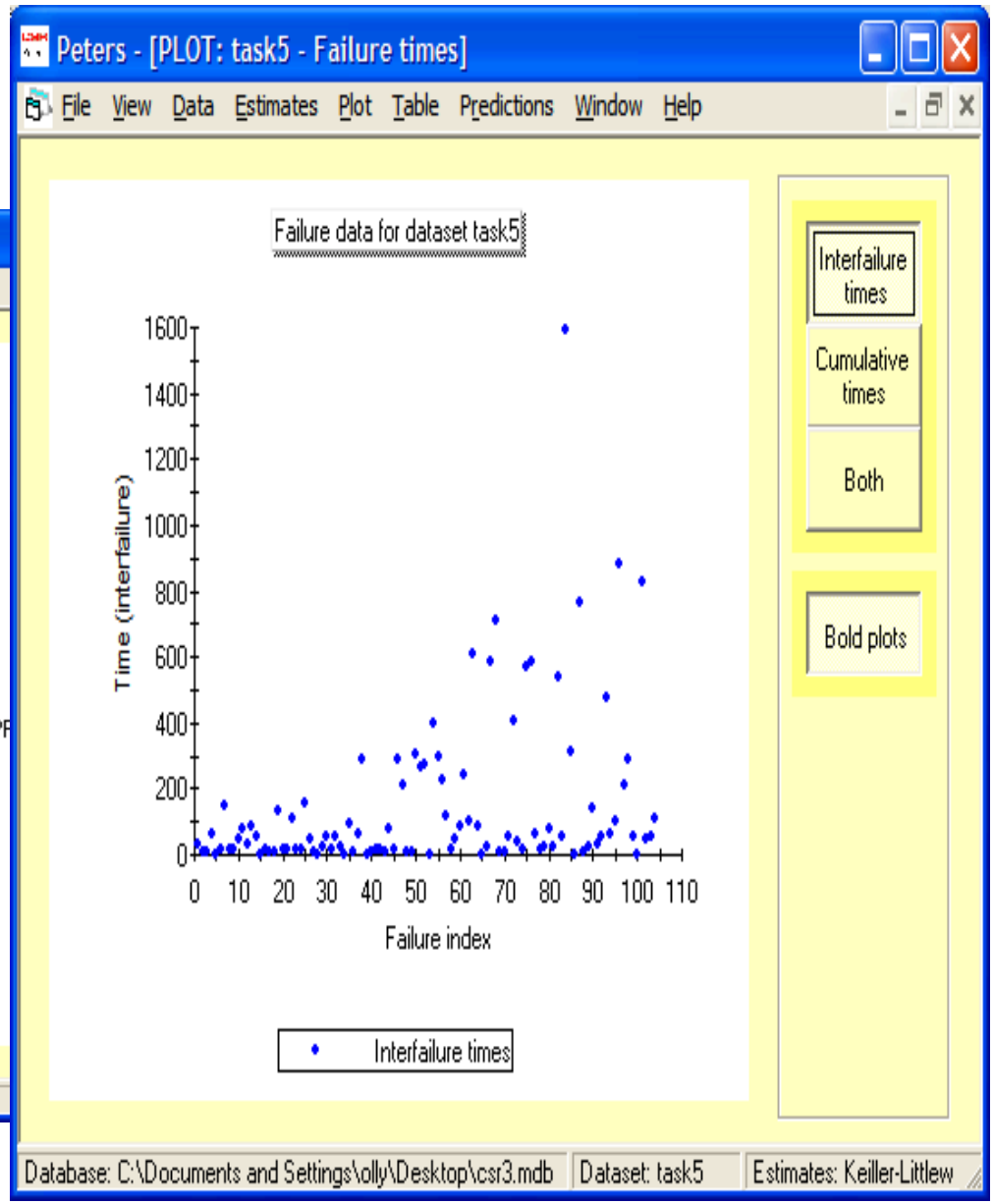

Select an estimates set
Select a set of estimates from the list of sets available for the current dataset
Model
Range start
Range end
Set size
Inference method
Musa-Okumoto 20 104 Maximum Likelihood
Goel-Okumoto 20 104 Maximum Likelihood
Littlewood 20 104 Maximum Likelihood
Littlewood NHPP 20 104 Maximum Likelihood
Littlewood-Verral 20 104 Maximum Likelihood
Keiller-Littlewood 20 104 Maximum Likelihood
OK
Cancel

Median Plots

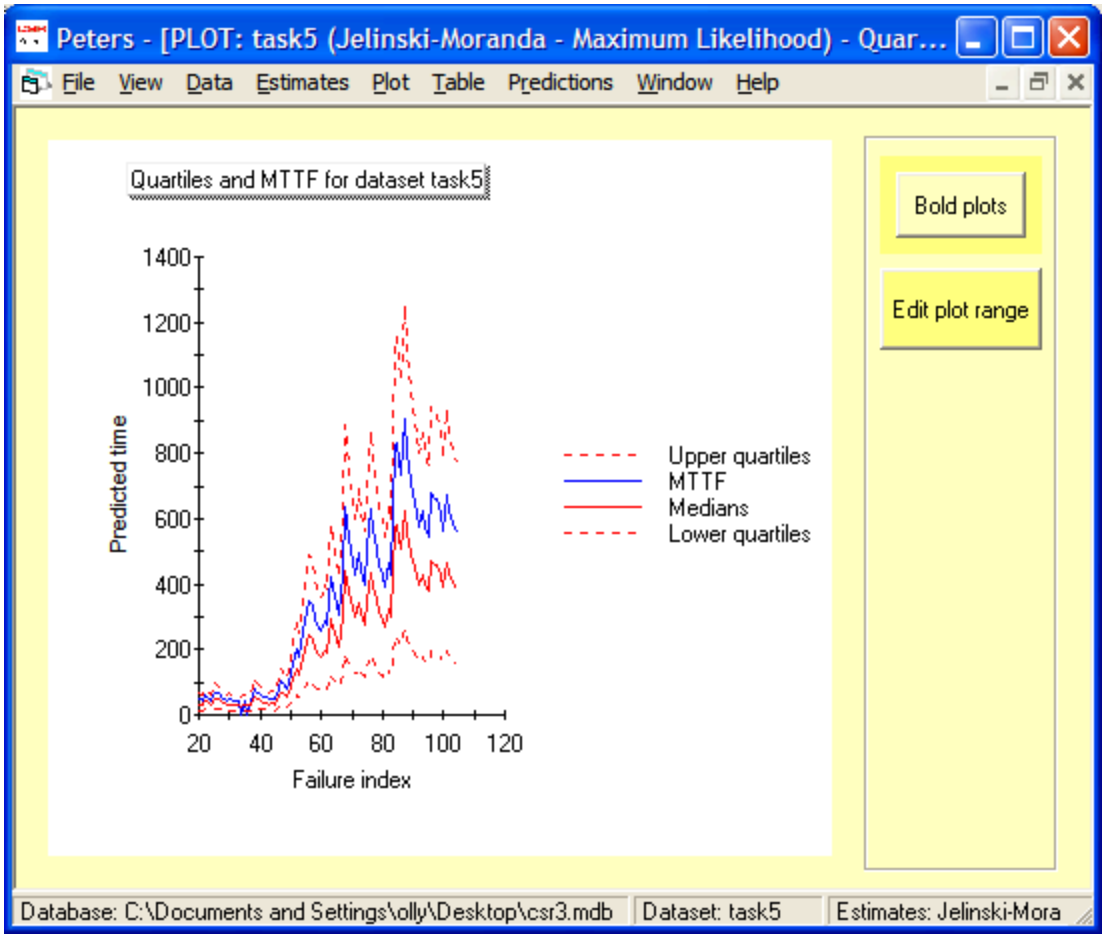


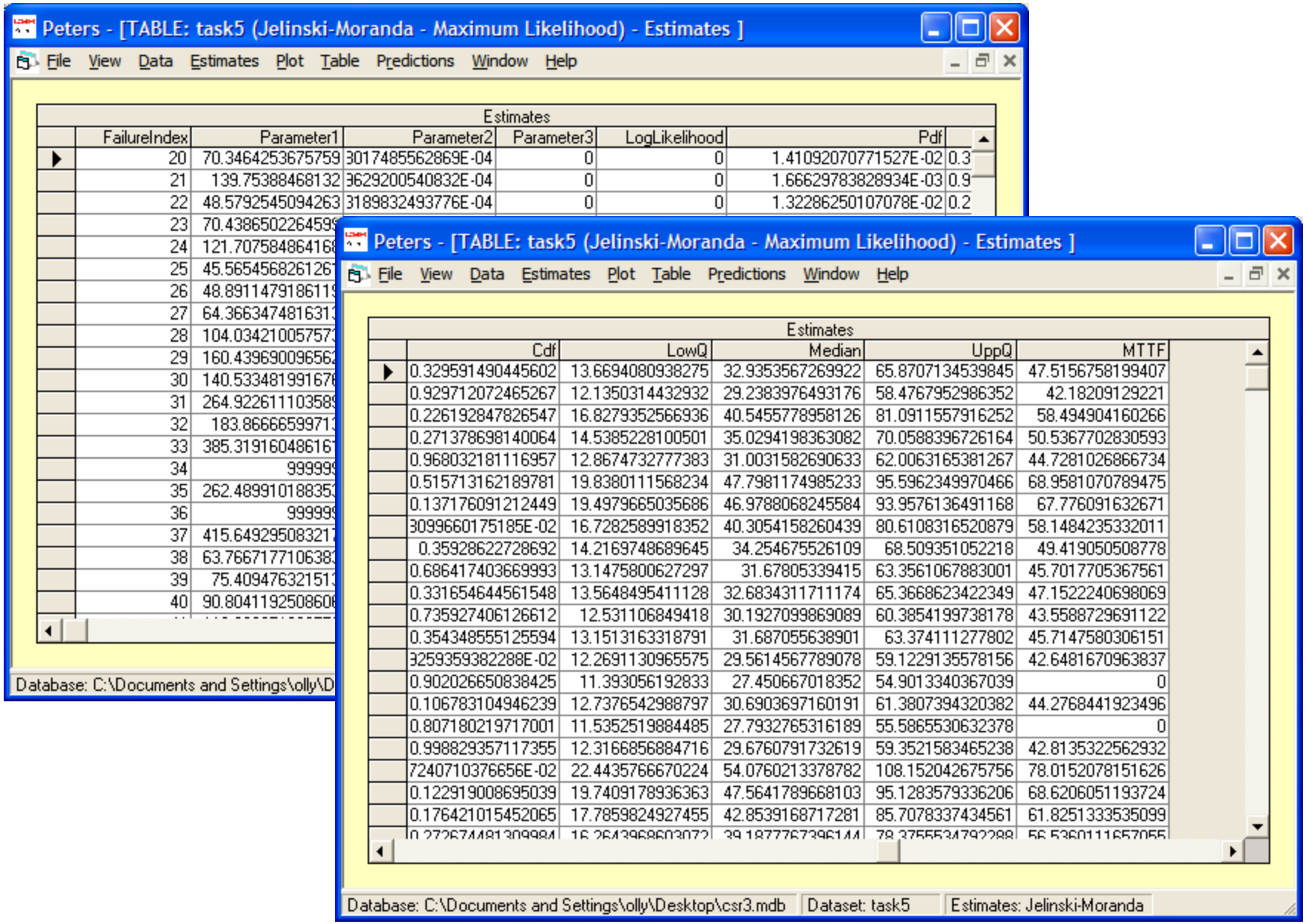
50/50?


Peters - [PLOT: task5 - Medians]
File View Data Estimates Plot Table Predictions Window Help
Medians for dataset task5
Predicted median time
Failure index
JM
Du
MO
GO
Li
LNHPP
LV
KL
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5

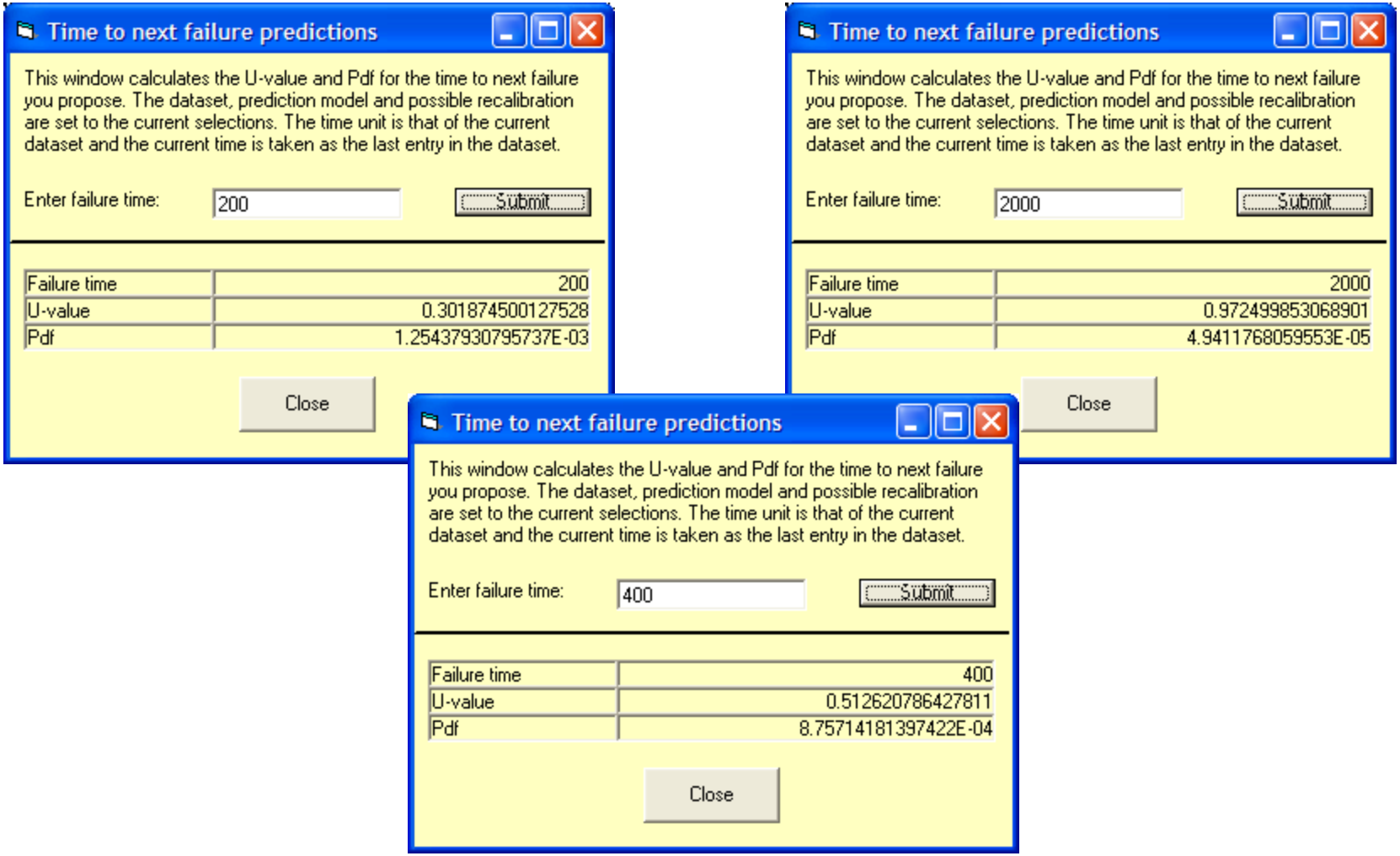

Peters - [PLOT: task5 - Failure times]
File View Data Estimates Plot Table Predictions Window Help
Failure data for dataset task5
Time (interfailure)
Failure index
Interfailure times
Interfailure times
Cumulative times
Both
Bold plots
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Keiller-Littlew

More data per model - JM

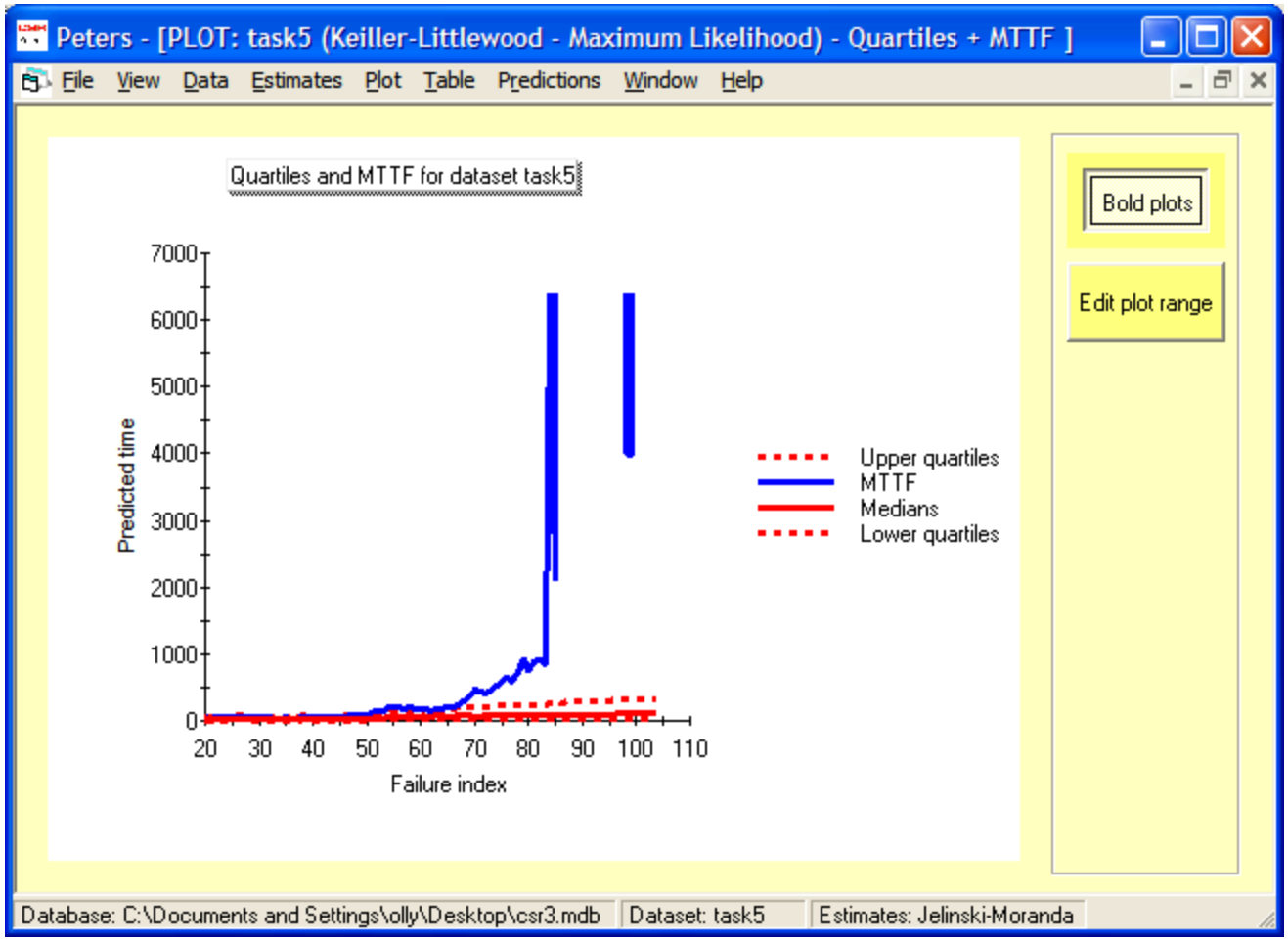


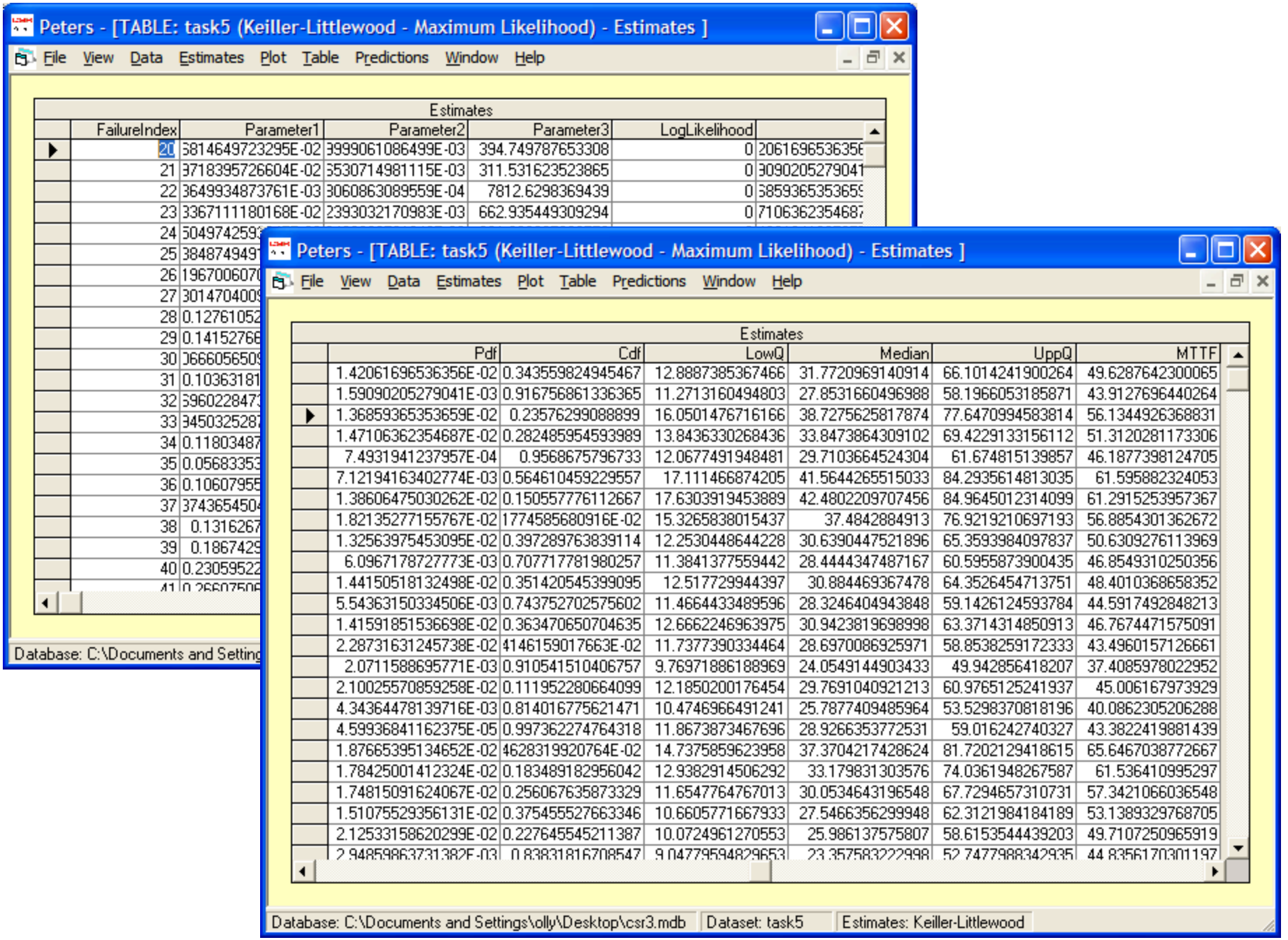

Peters - [TABLE: task5 (Jelinski-Moranda - Maximum Likelihood) - Estimates]
File View Data Estimates Plot Table Predictions Window Help
Estimates
FailureIndex Parameter1 Parameter2 Parameter3 LogLikelihood Pdf
20 70.3464253675759 3017485562869E-04 0 0 1.41092070771527E-02 0.3
21 139.75388468132 3629200540832E-04 0 0 1.66629783828934E-03 0.9
22 48.5792545094263 3189832493776E-04 0 0 1.32286250107078E-02 0.2
23 70.4386502264599
24 121.707584864168
25 45.5654568261261
26 48.8911479186119
27 64.3663474816313
28 104.034210057573
29 160.439690096562
30 140.533481991678
31 264.922611103589
32 183.866665997113
33 385.319160486161
34 999999
35 262.489910188353
36 999999
37 415.649295083217
38 63.7667177106383
39 75.4094763215113
40 90.8041192508606
Database: C:\Documents and Settings\olly\D
Peters - [TABLE: task5 (Jelinski-Moranda - Maximum Likelihood) - Estimates]
File View Data Estimates Plot Table Predictions Window Help
Estimates
Cdf LowQ Median UppQ MTTF
0.329591490445602 13.6694080938275 32.9353567269922 65.8707134539845 47.5156758199407
0.929712072465267 12.1350314432932 29.2383976493176 58.4767952986352 42.18209129221
0.226192847826547 16.8279352566936 40.5455778958126 81.0911557916252 58.494904160266
0.271378698140064 14.5385228100501 35.0294198363082 70.0588396726164 50.5367702830593
0.968032181116957 12.8674732777383 31.0031582690633 62.0063165381267 44.7281026866734
0.515713162189781 19.8380111568234 47.7981174985233 95.5962349970466 68.9581070789475
0.137176091212449 19.4979665035686 46.9788068245584 93.95761364911168 67.776091632671
3099660175185E-02 16.7282589918352 40.3054158260439 80.6108316520879 58.1484235332011
0.35928622728692 14.2169748689645 34.254675526109 68.509351052218 49.419050508778
0.686417403669993 13.1475800627297 31.67805339415 63.3561067883001 45.7017705367561
0.331654644561548 13.5648495411128 32.6834311711174 65.3668623422349 47.1522240698069
0.735927406126612 12.531106849418 30.1927099869089 60.3854199738178 43.5588729691122
0.354348555125594 13.1513163318791 31.687055638901 63.374111277802 45.7147580306151
3259359382288E-02 12.2691130965575 29.5614567789078 59.1229135578156 42.6481670963837
0.902026650838425 11.393056192833 27.450667018352 54.9013340367039 0
0.106783104946239 12.7376542988797 30.6903697160191 61.3807394320382 44.2768441923496
0.807180219717001 11.5352519884485 27.7932765316189 55.5865530632378 0
0.998829357117355 12.3166856884716 29.6760791732619 59.3521583465238 42.8135322562932
7240710376656E-02 22.4435766670224 54.0760213378782 108.152042675756 78.0152078151626
0.122919008695039 19.7409178936363 47.5641789668103 95.1283579336206 68.6206051193724
0.176421015452065 17.7859824927455 42.8539168717281 85.7078337434561 61.8251333535099
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Jelinski-Moranda

JM Predictions



More data per model - KL





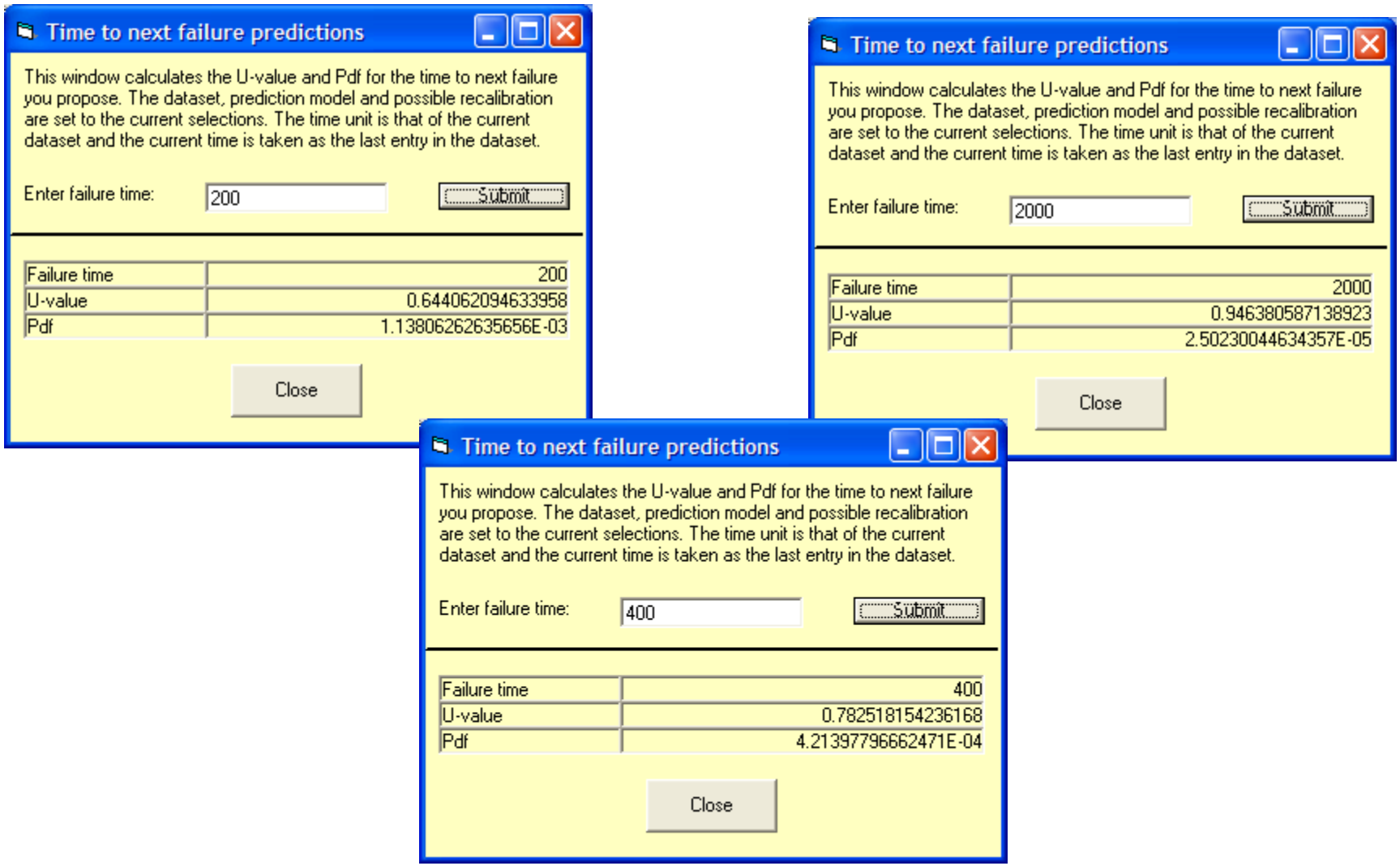
Estimates

FailureIndex	Parameter1	Parameter2	Parameter3	LogLikelihood	
20	6814649723295E-02	9999061086499E-03	394.749787653308	0	206169653635
21	9718395726604E-02	6530714981115E-03	311.531623523865	0	9090205279041
22	3649934873761E-03	3060863089559E-04	7812.6298369439	0	6859365353659
23	3367111180168E-02	2393032170983E-03	662.935449309294	0	7106362354687
24	504974259				
25	384874949				
26	1967006070				
27	3014704009				
28	0.12761052				
29	0.14152766				
30	0666056509				
31	0.10363181				
32	696022847				
33	945032528				
34	0.11803487				
35	0.05683353				
36	0.10607955				
37	374365450				
38	0.1316267				
39	0.1867429				
40	0.23059522				
41	0.26607506				

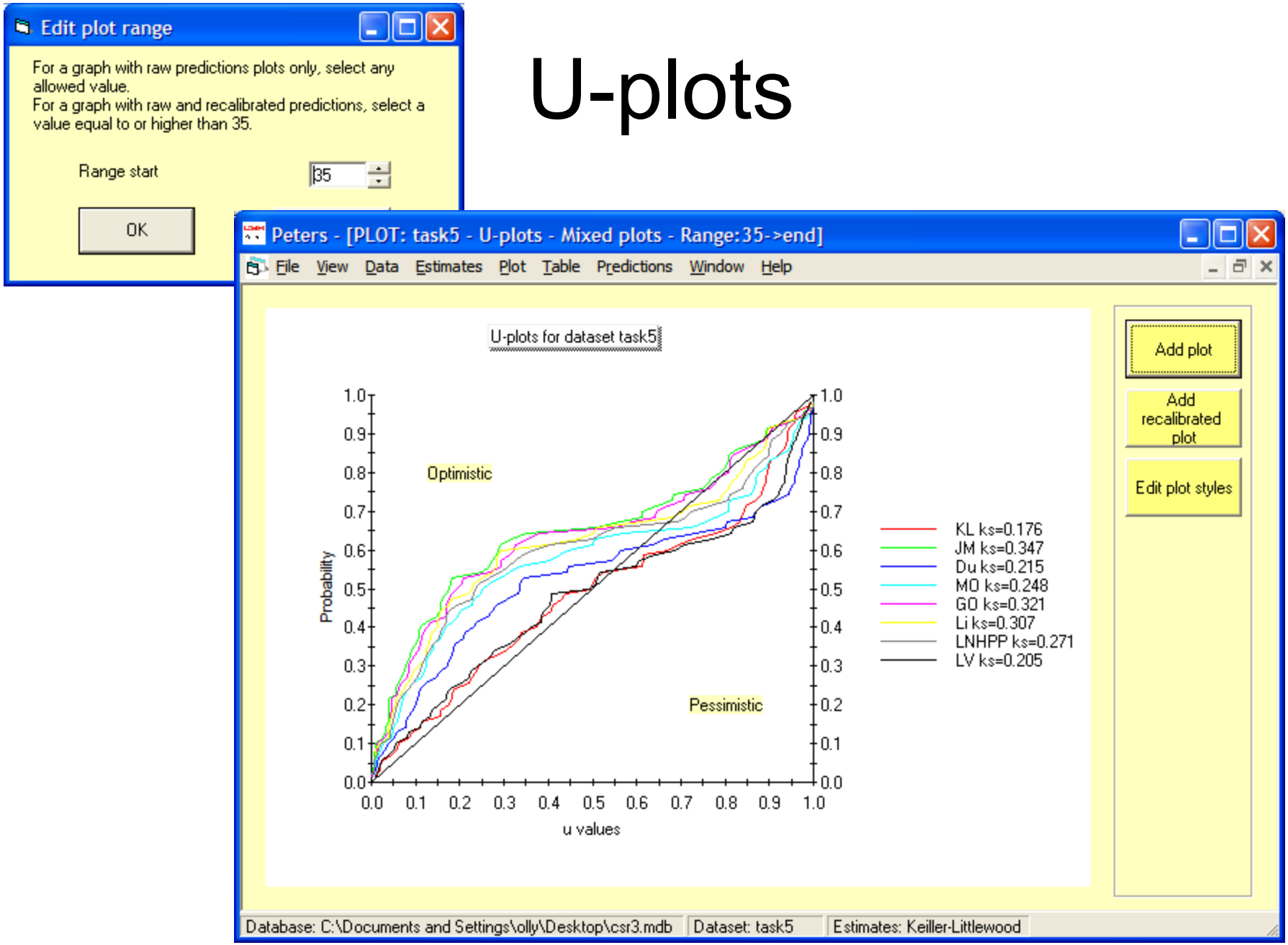
Estimates

Pdf	Cdf	LowQ	Median	UppQ	MTTF
1.42061696536356E-02	0.343559824945467	12.8887385367466	31.7720969140914	66.1014241900264	49.6287642300065
1.59090205279041E-03	0.916756861336365	11.2713160494803	27.8531660496988	58.1966053185871	43.9127696440264
1.36859365353659E-02	0.23576299088899	16.0501476716166	38.7275625817874	77.6470994583814	56.1344926368831
1.47106362354687E-02	0.282485954593989	13.8436330268436	33.8473864309102	69.4229133156112	51.3120281173306
7.4931941237957E-04	0.9568675796733	12.0677491948481	29.7103664524304	61.674815139857	46.1877398124705
7.12194163402774E-03	0.564610459229557	17.111466874205	41.5644265515033	84.2935614813035	61.595882324053
1.38606475030262E-02	0.150557776112667	17.6303919453889	42.4802209707456	84.9645012314099	61.2915253957367
1.82135277155767E-02	1774585680916E-02	15.3265838015437	37.4842884913	76.9219210697193	56.8854301362672
1.32563975453095E-02	0.397289763839114	12.2530448644228	30.6390447521896	65.3593984097837	50.6309276113969
6.0967178727773E-03	0.707717781980257	11.3841377559442	28.4444347487167	60.5955873900435	46.8549310250356
1.44150518132498E-02	0.351420545399095	12.517729944397	30.884469367478	64.3526454713751	48.4010368658352
5.54363150334506E-03	0.743752702575602	11.4664433489596	28.3246404943848	59.1426124593784	44.5917492848213
1.41591851536698E-02	0.363470650704635	12.6662246963975	30.9423819698998	63.3714314850913	46.7674471575091
2.28731631245738E-02	4146159017663E-02	11.7377390334464	28.6970086925971	58.8538259172333	43.4960157126661
2.0711588695771E-03	0.910541510406757	9.76971886188969	24.0549144903433	49.942856418207	37.4085978022952
2.10025570859258E-02	0.111952280664099	12.1850200176454	29.7691040921213	60.9765125241937	45.006167973929
4.34364478139716E-03	0.814016775621471	10.4746966491241	25.7877409485964	53.5298370818196	40.0862305206288
4.59936841162375E-05	0.997362274764318	11.8673873467696	28.9266353772531	59.016242740327	43.3822419881439
1.87665395134652E-02	4628319920764E-02	14.7375859623958	37.3704217428624	81.7202129418615	65.6467038772667
1.78425001412324E-02	0.183489182956042	12.9382914506292	33.179831303576	74.0361948267587	61.536410995297
1.74815091624067E-02	0.256067635873329	11.6547764767013	30.0534643196548	67.7294657310731	57.3421066036548
1.51075529356131E-02	0.375455527663346	10.6605771667933	27.5466356299948	62.3121984184189	53.1389329768705
2.12533158620299E-02	0.227645545211387	10.0724961270553	25.986137575807	58.6153544439203	49.7107250965919
2.94859863731382E-03	0.83831816708547	9.04779594829653	23.357583222998	52.7477988342935	44.8356170301197

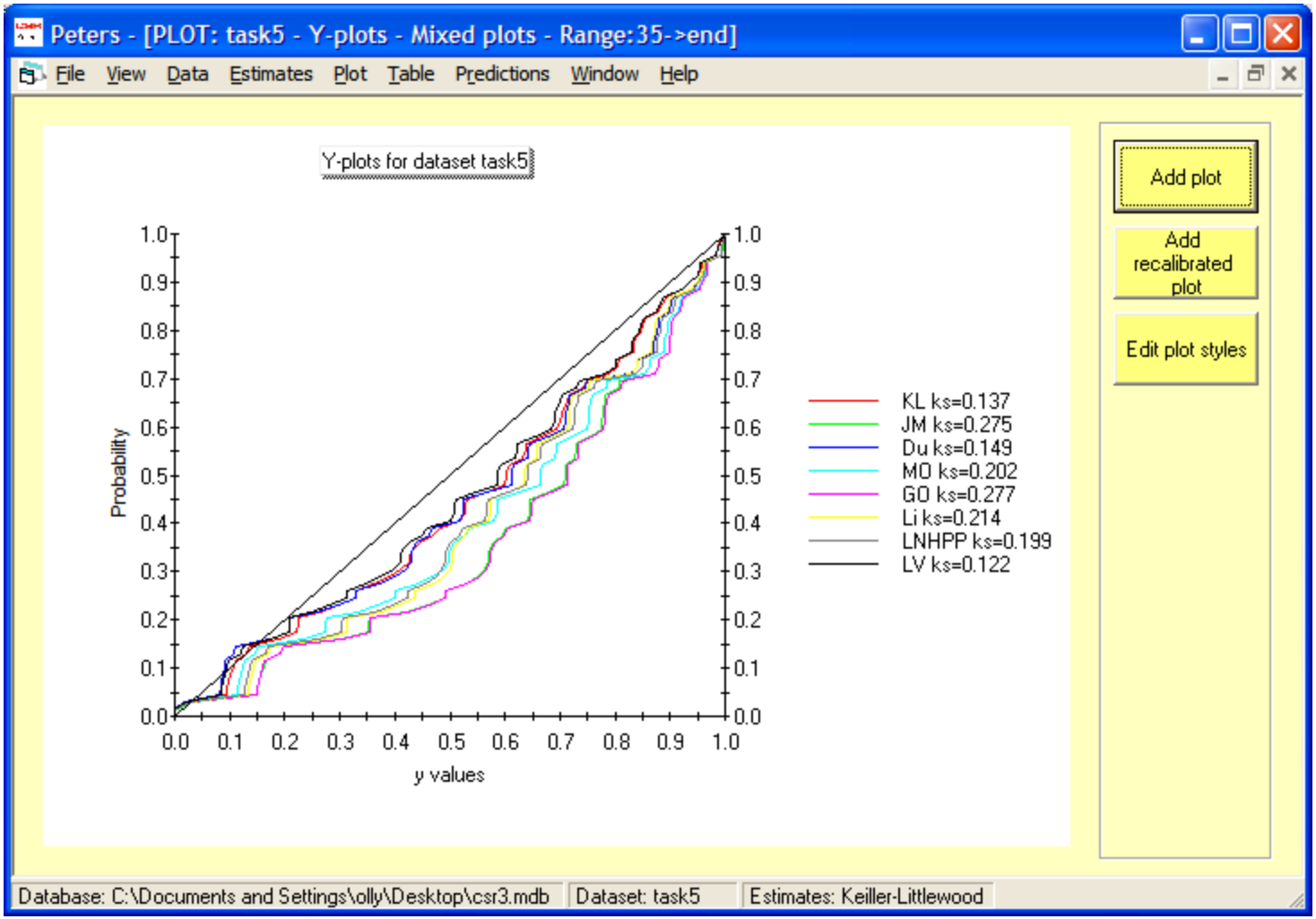
KL predictions



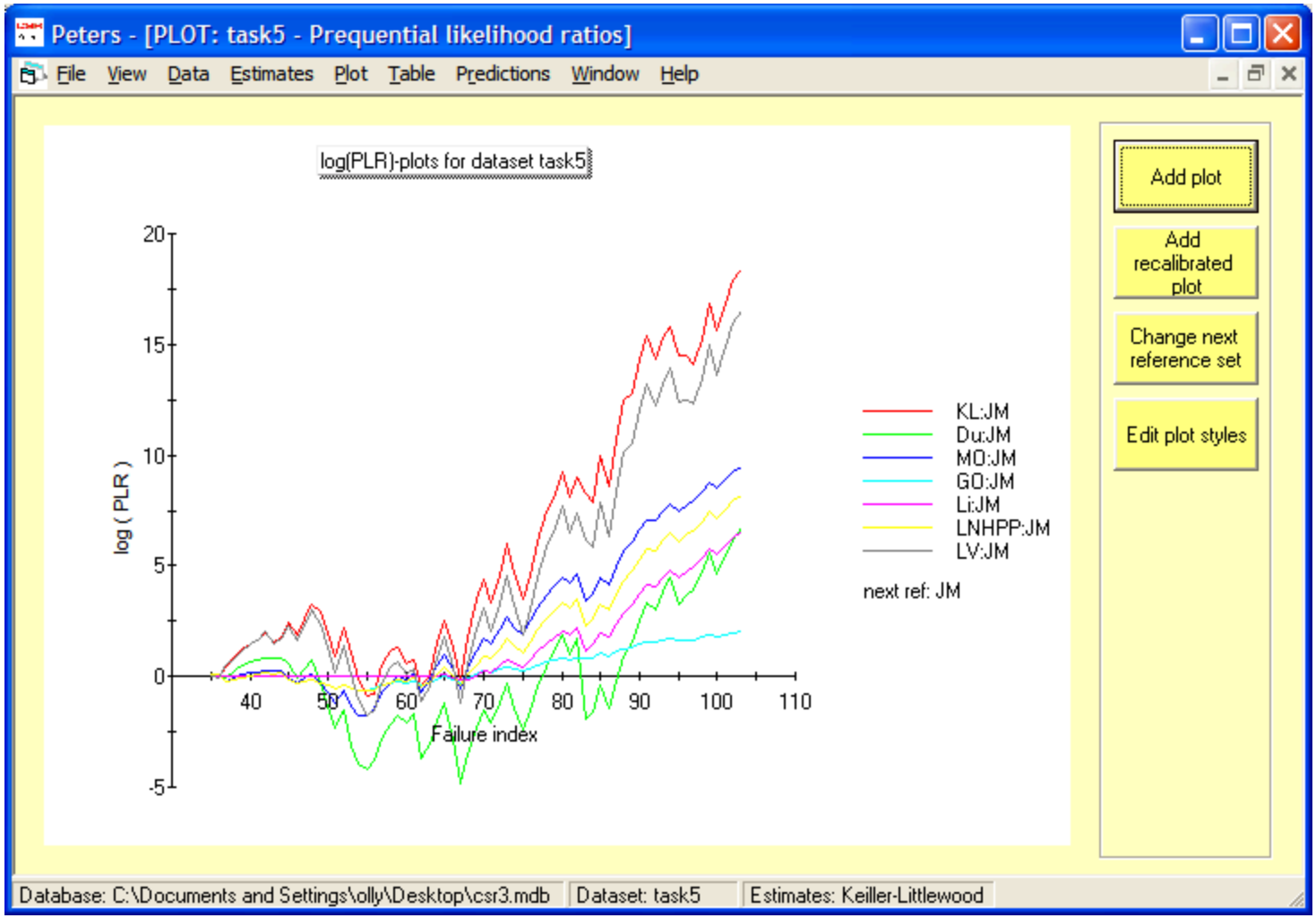
U-plots


Edit plot range
For a graph with raw predictions plots only, select any allowed value.
For a graph with raw and recalibrated predictions, select a value equal to or higher than 35.
Range start
35
OK
Peters - [PLOT: task5 - U-plots - Mixed plots - Range:35->end]
File View Data Estimates Plot Table Predictions Window Help
U-plots for dataset task5
Optimistic
Pessimistic
Probability
u values
KL ks=0.176
JM ks=0.347
Du ks=0.215
MO ks=0.248
GO ks=0.321
Li ks=0.307
LNHPP ks=0.271
LV ks=0.205
Add plot
Add recalibrated plot
Edit plot styles
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Keiller-Littlewood

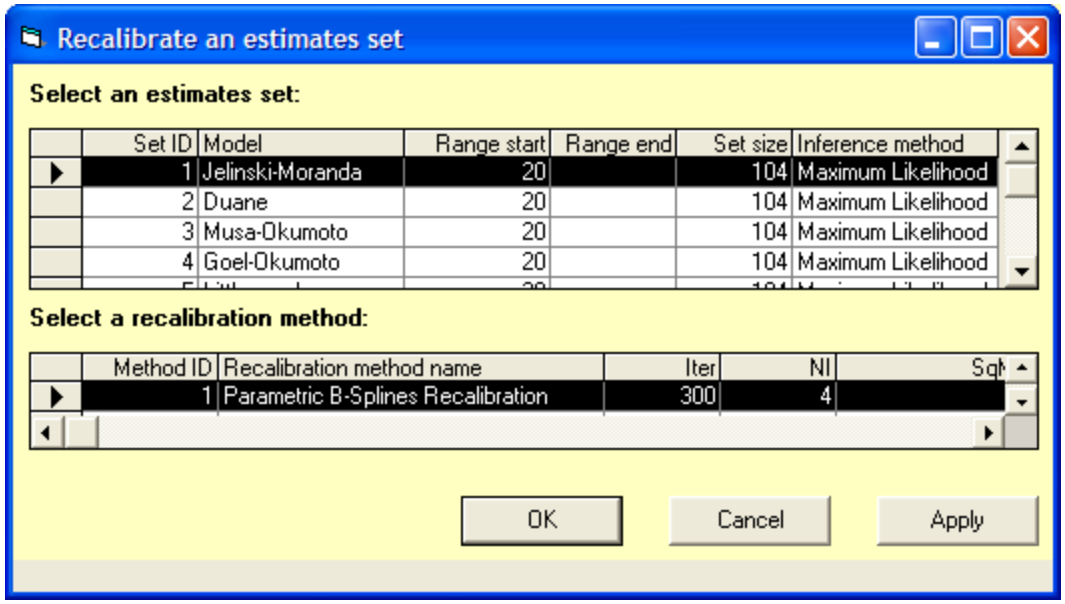
Y-plots


Peters - [PLOT: task5 - Y-plots - Mixed plots - Range:35->end]
File View Data Estimates Plot Table Predictions Window Help
Y-plots for dataset task5
Probability
y values
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
KL ks=0.137
JM ks=0.275
Du ks=0.149
MO ks=0.202
GO ks=0.277
Li ks=0.214
LNHPP ks=0.199
LV ks=0.122
Add plot
Add recalibrated plot
Edit plot styles
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Keiller-Littlewood

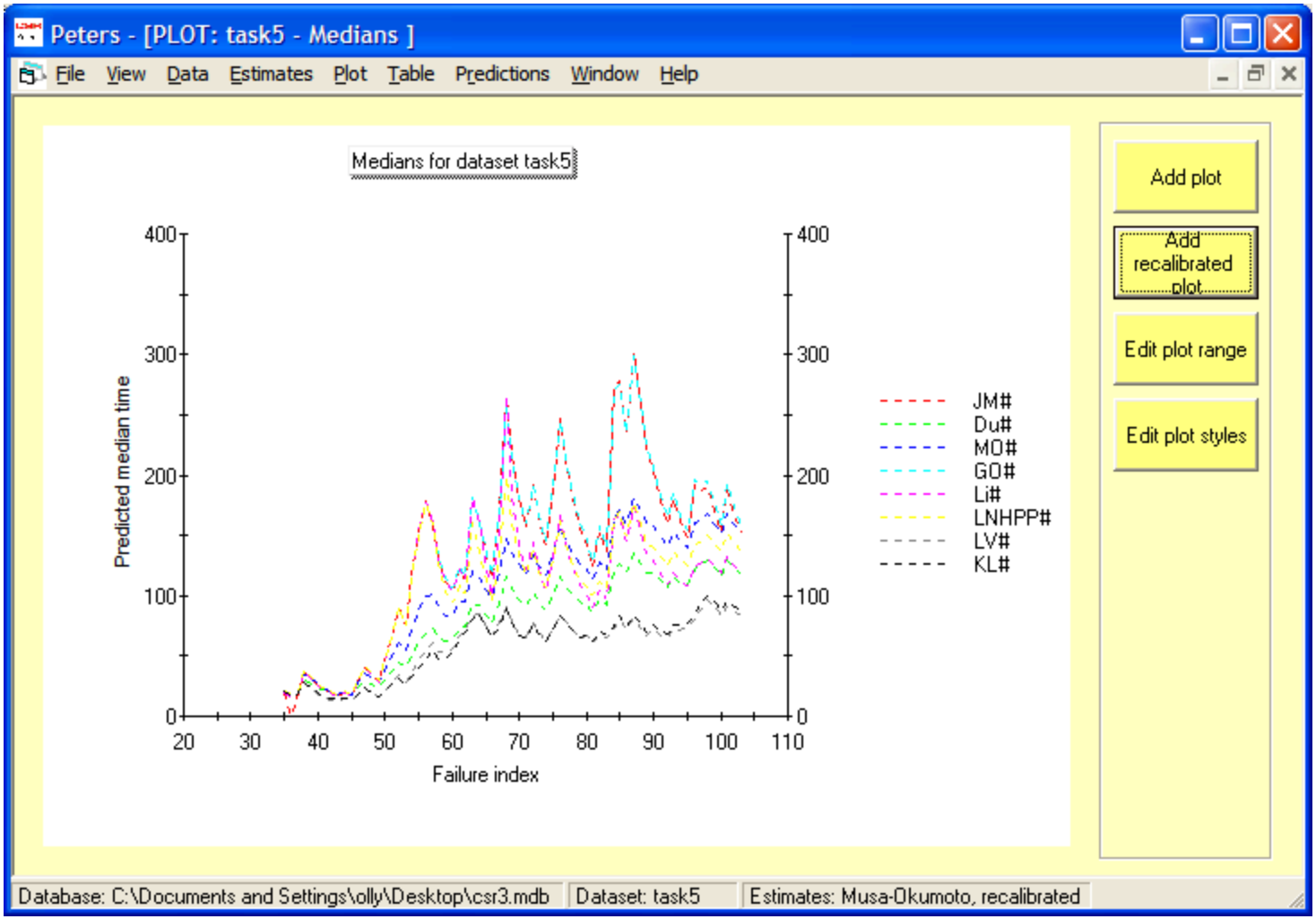
PLR plots


Peters - [PLOT: task5 - Prequential likelihood ratios]
File View Data Estimates Plot Table Predictions Window Help
log(PLR)-plots for dataset task5
log (PLR)
Failure index
KL:JM
Du:JM
MO:JM
GO:JM
Li:JM
LNHPP:JM
LV:JM
next ref: JM
Add plot
Add recalibrated plot
Change next reference set
Edit plot styles
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Keiller-Littlewood

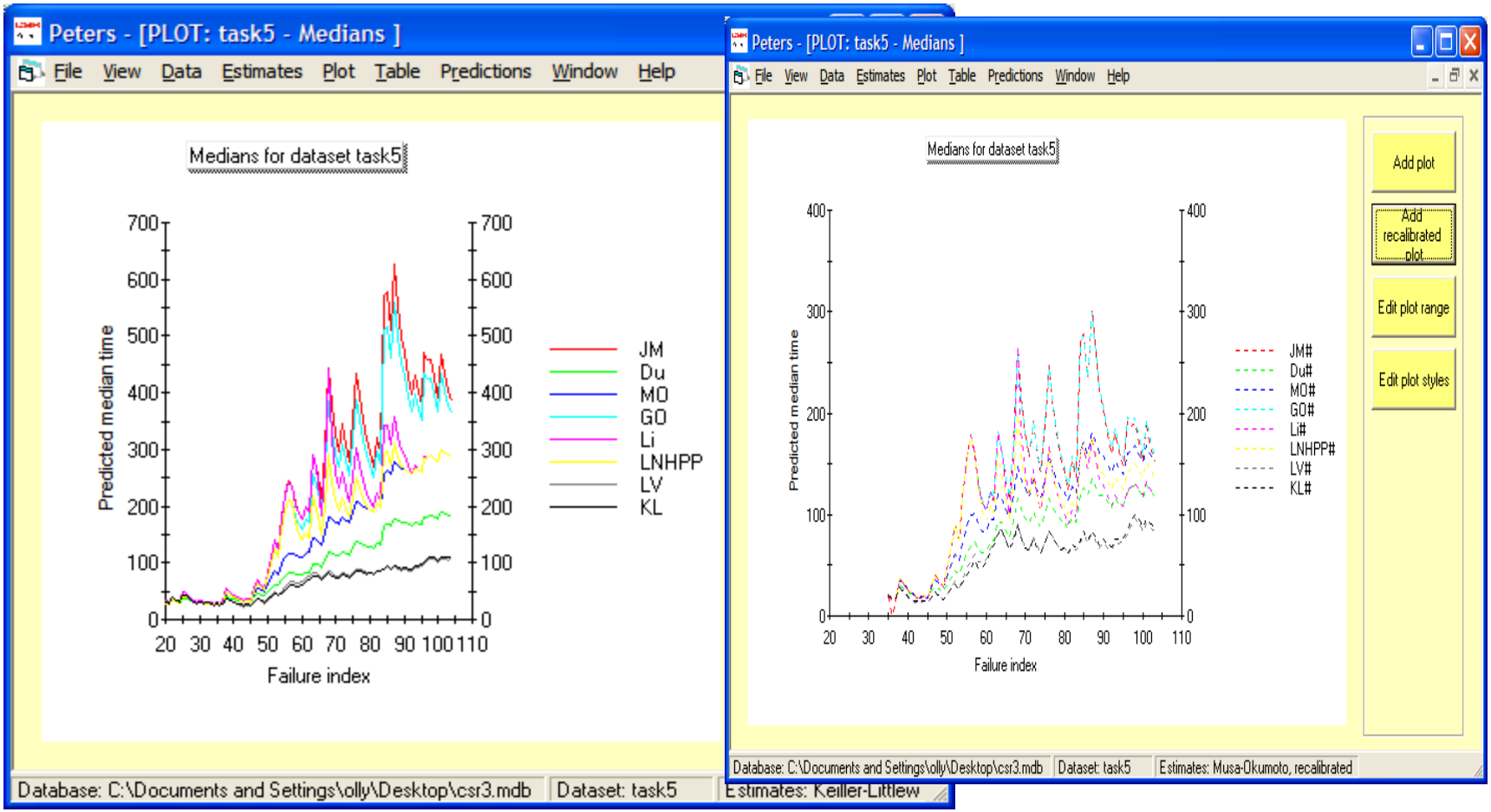
Recalibration

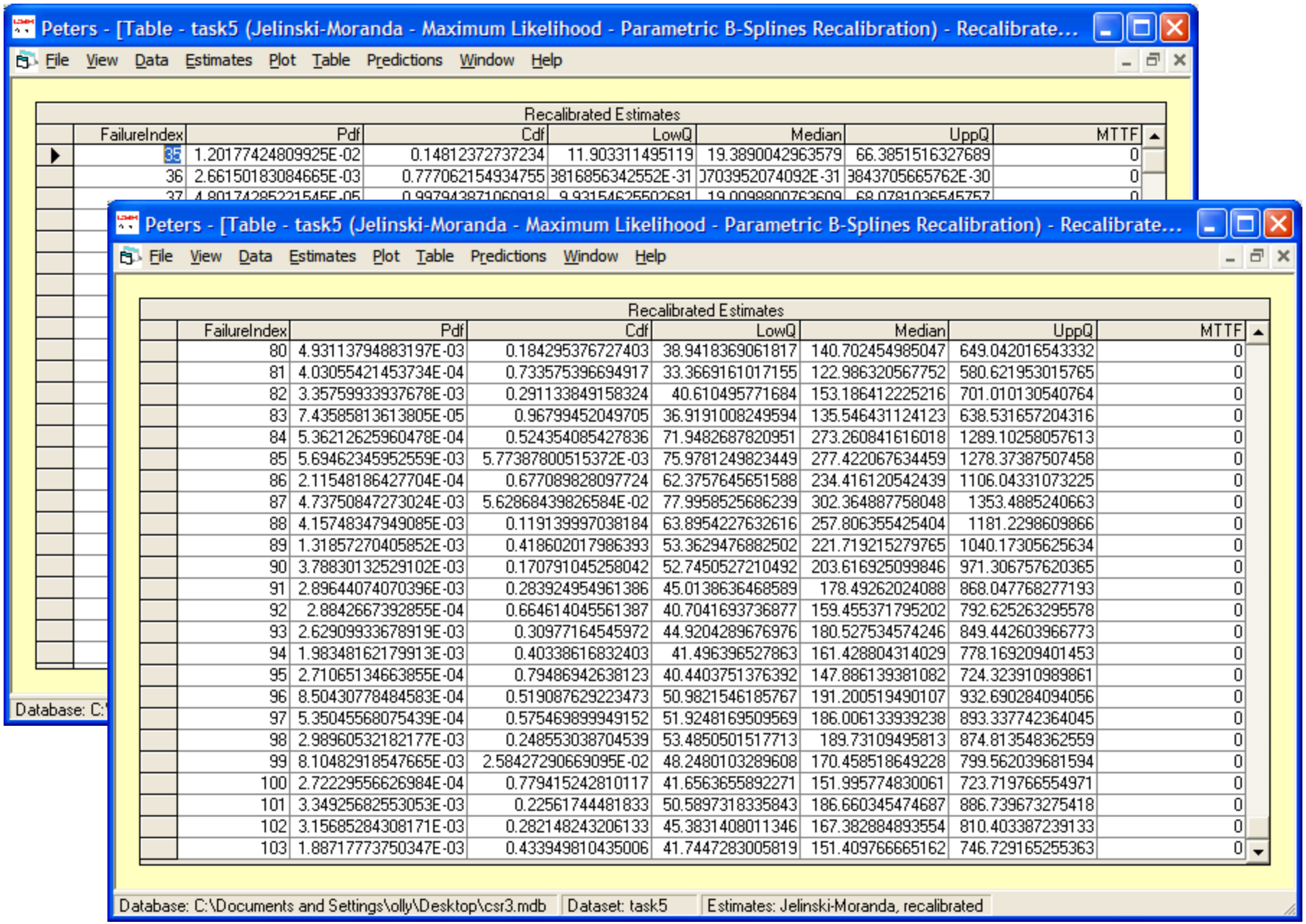


New medians


Peters - [PLOT: task5 - Medians]
File View Data Estimates Plot Table Predictions Window Help
Medians for dataset task5
Predicted median time
Failure index
400
300
200
100
0
20 30 40 50 60 70 80 90 100 110
JM#
Du#
MO#
GO#
Li#
LNHPP#
LV#
KL#
Add plot
Add recalibrated plot
Edit plot range
Edit plot styles
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Musa-Okumoto, recalibrated

Old v new


Peters - [PLOT: task5 - Medians]
File View Data Estimates Plot Table Predictions Window Help
Medians for dataset task5
Predicted median time
Failure index
JM
Du
MO
GO
Li
LNHPP
LV
KL
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Keiller-Littlew
Peters - [PLOT: task5 - Medians]
File View Data Estimates Plot Table Predictions Window Help
Medians for dataset task5
Predicted median time
Failure index
JM#
Du#
MO#
GO#
Li#
LNHPP#
LV#
KL#
Add plot
Add recalibrated plot
Edit plot range
Edit plot styles
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Musa-Okumoto, recalibrated


Peters - [Table - task5 (Jelinski-Moranda - Maximum Likelihood - Parametric B-Splines Recalibration) - Recalibrate...
File View Data Estimates Plot Table Predictions Window Help
Recalibrated Estimates
FailureIndex Pdf Cdf LowQ Median UppQ MTTF
35 1.20177424809925E-02 0.14812372737234 11.903311495119 19.3890042963579 66.3851516327689 0
36 2.66150183084665E-03 0.77706215493475 3816856342552E-31)703952074092E-31 3843705665762E-30 0
Peters - [Table - task5 (Jelinski-Moranda - Maximum Likelihood - Parametric B-Splines Recalibration) - Recalibrate...
File View Data Estimates Plot Table Predictions Window Help
Recalibrated Estimates
FailureIndex Pdf Cdf LowQ Median UppQ MTTF
80 4.93113794883197E-03 0.184295376727403 38.9418369061817 140.702454985047 649.042016543332 0
81 4.03055421453734E-04 0.733575396694917 33.3669161017155 122.986320567752 580.621953015765 0
82 3.35759933937678E-03 0.291133849158324 40.610495771684 153.186412225216 701.010130540764 0
83 7.43585813613805E-05 0.96799452049705 36.9191008249594 135.546431124123 638.531657204316 0
84 5.36212625960478E-04 0.524354085427836 71.9482687820951 273.260841616018 1289.10258057613 0
85 5.69462345952559E-03 5.77387800515372E-03 75.9781249823449 277.422067634459 1278.37387507458 0
86 2.115481864277O4E-04 0.677089828097724 62.3757645651588 234.416120542439 1106.04331073225 0
87 4.737508472730 24E-03 5.62868439826584E-02 77.9958525686239 302.364887758048 1353.4885240663 0
88 4.15748347949085E-03 0.119139997038184 63.8954227632616 257.806355425404 1181.2298609866 0
89 1.31857270405852E-03 0.418602017986393 53.3629476882502 221.719215279765 1040.17305625634 0
90 3.78830132529102E-03 0.170791045258042 52.7450527210492 203.616925099846 971.306757620365 0
91 2.896440740703 96E-03 0.283924954961386 45.0138636468589 178.49262024088 868.047768277193 0
92 2.8842667392855E-04 0.664614045561387 40.7041693736877 159.455371795202 792.625263295578 0
93 2.629099336789 19E-03 0.30977164545972 44.9204289676976 180.527534574246 849.442603966773 0
94 1.983481621799 13E-03 0.40338616832403 41.496396527863 161.428804314029 778.169209401453 0
95 2.710651346638 55E-04 0.79486942638123 40.4403751376392 147.886139381082 724.323910989861 0
96 8.504307784845 83E-04 0.519087629223473 50.9821546185767 191.200519490107 932.690284094056 0
97 5.350455680754 39E-04 0.575469899949152 51.9248169509569 186.006133939238 893.337742364045 0
98 2.989605321821 77E-03 0.248553038704539 53.4850501517713 189.73109495813 874.813548362559 0
99 8.104829185476 65E-03 2.58427290669095E-02 48.2480103289608 170.458518649228 799.562039681594 0
100 2.722295566269 84E-04 0.779415242810117 41.6563655892271 151.995774830061 723.719766554971 0
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102 3.156852843081 71E-03 0.282148243206133 45.3831408011346 167.382884893554 810.403387239133 0
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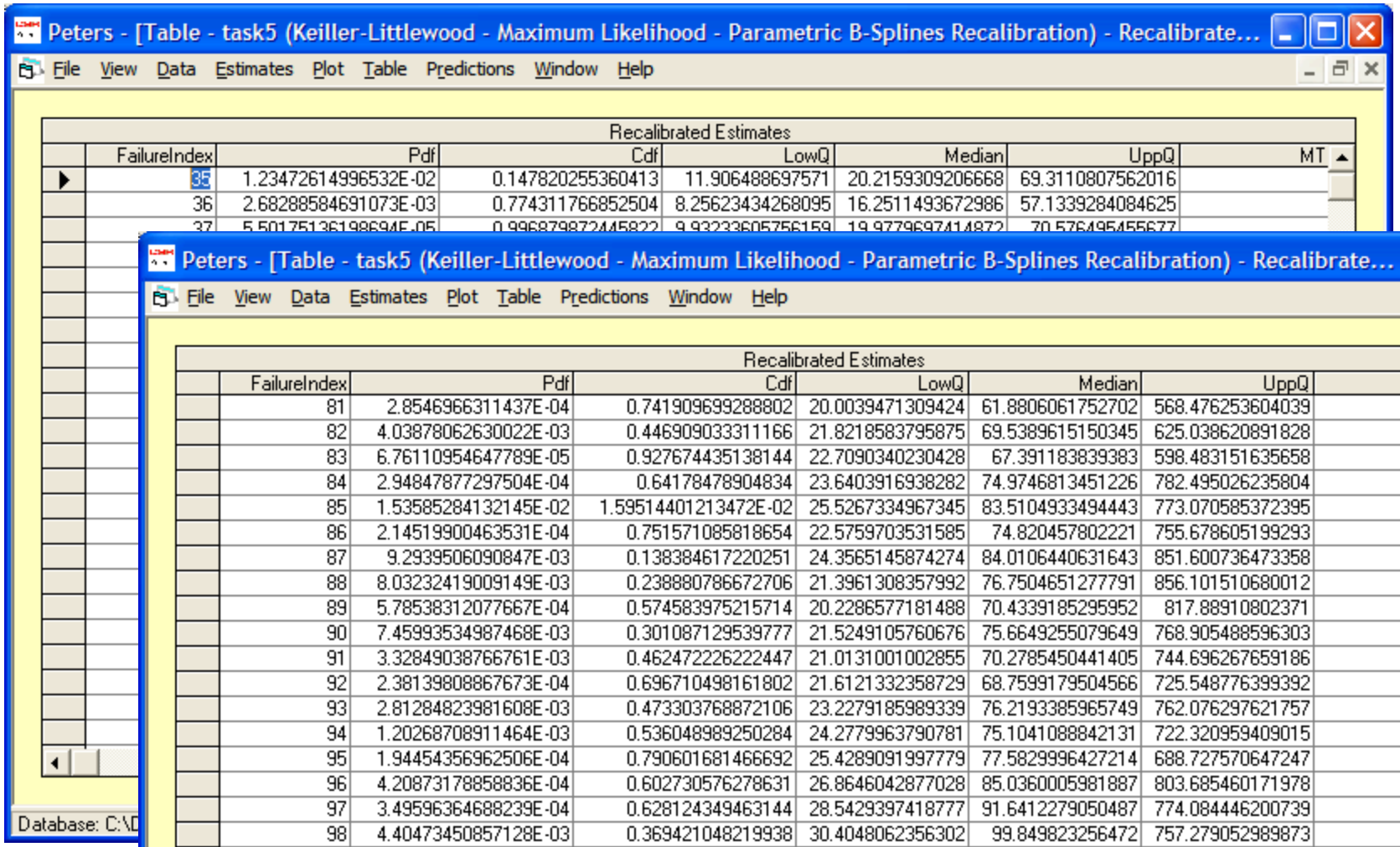
Dataset: task5
Estimates: Jelinski-Moranda, recalibrated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File View Data Estimates Plot Table Predictions Window Help
Recalibrated Estimates
FailureIndex Pdf Cdf LowQ Median UppQ MT
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36 2.68288584691073E-03 0.774311766852504 8.25623434268095 16.2511493672986 57.1339284084625
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File View Data Estimates Plot Table Predictions Window Help
Recalibrated Estimates
FailureIndex Pdf Cdf LowQ Median UppQ MT
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82 4.03878062630022E-03 0.446909033311166 21.8218583795875 69.5389615150345 625.038620891828
83 6.76110954647789E-05 0.927674435138144 22.7090340230428 67.391183839383 598.483151635658
84 2.94847877297504E-04 0.64178478904834 23.6403916938282 74.9746813451226 782.495026235804
85 1.53585284132145E-02 1.59514401213472E-02 25.5267334967345 83.5104933494443 773.070585372395
86 2.14519900463531E-04 0.751571085818654 22.5759703531585 74.820457802221 755.678605199293
87 9.2939506090847E-03 0.138384617220251 24.3565145874274 84.0106440631643 851.600736473358
88 8.03232419009149E-03 0.238880786672706 21.3961308357992 76.7504651277791 856.101510680012
89 5.78538312077667E-04 0.574583975215714 20.2286577181488 70.4339185295952 817.88910802371
90 7.45993534987468E-03 0.301087129539777 21.5249105760676 75.6649255079649 768.905488596303
91 3.32849038766761E-03 0.462472226222447 21.0131001002855 70.2785450441405 744.696267659186
92 2.38139808867673E-04 0.696710498161802 21.6121332358729 68.7599179504566 725.548776399392
93 2.81284823981608E-03 0.473303768872106 23.2279185989339 76.2193385965749 762.076297621757
94 1.20268708911464E-03 0.536048989250284 24.2779963790781 75.1041088842131 722.320959409015
95 1.94454356962506E-04 0.790601681466692 25.4289091997779 77.5829996427214 688.727570647247
96 4.20873178858836E-04 0.602730576278631 26.8646042877028 85.0360005981887 803.685460171978
97 3.49596364688239E-04 0.628124349463144 28.5429397418777 91.6412279050487 774.084446200739
98 4.40473450857128E-03 0.369421048219938 30.4048062356302 99.849823256472 757.279052989873
99 1.21309712090671E-02 4.10539363861545E-02 30.9915374531634 95.4078949257895 734.277359324891
100 1.9698873793247E-04 0.768123904610951 27.485076124496 87.7376898253147 740.245351131839
101 5.27286200441547E-03 0.326918403849276 29.4025394963573 95.7291116549015 814.979009779481
102 4.55795093948478E-03 0.39351514897955 29.5273720207108 90.675443905096 786.055624706244
103 1.1872423328664E-03 0.532295376147866 30.2085659393322 87.3569945046213 762.700615313297
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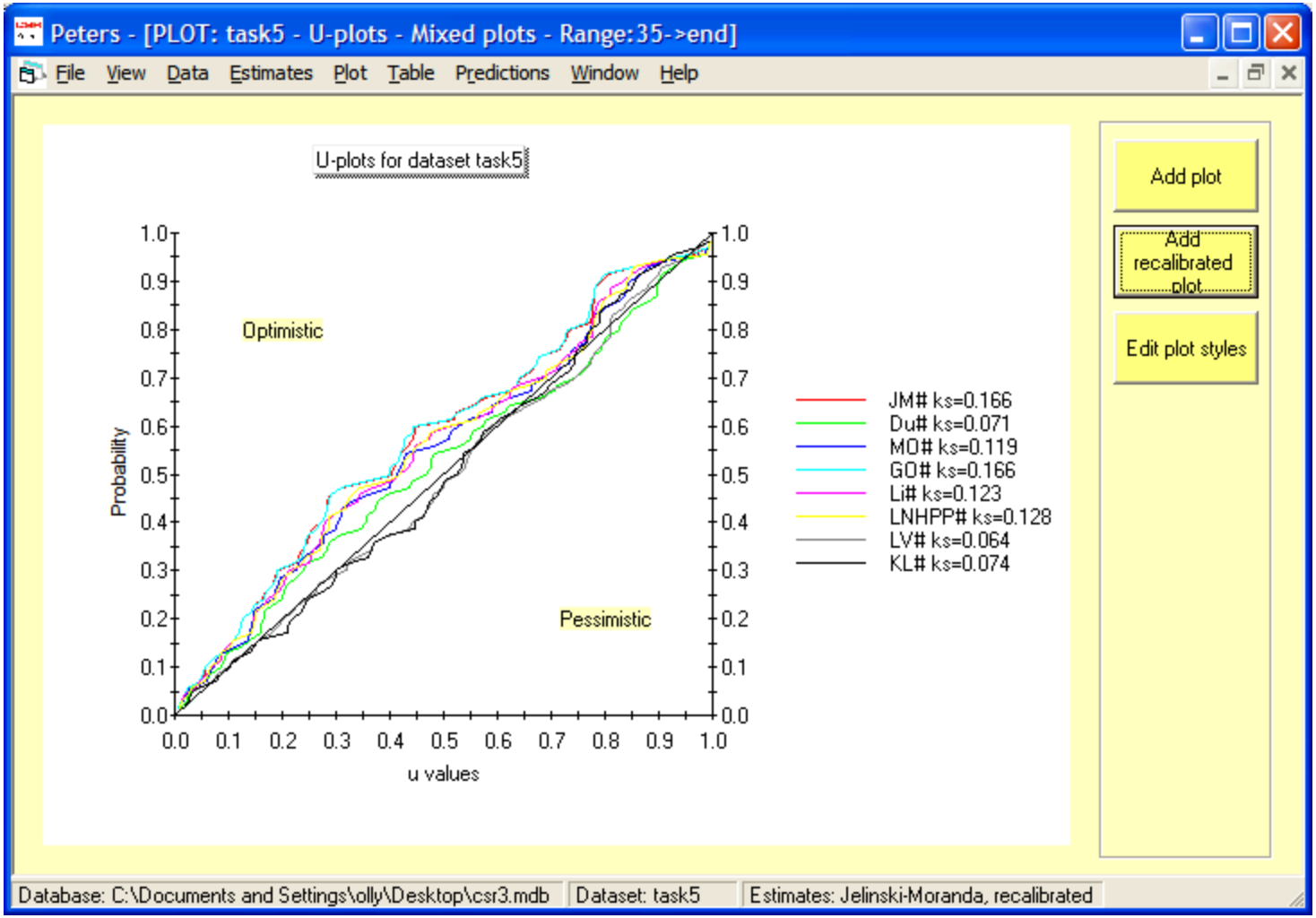
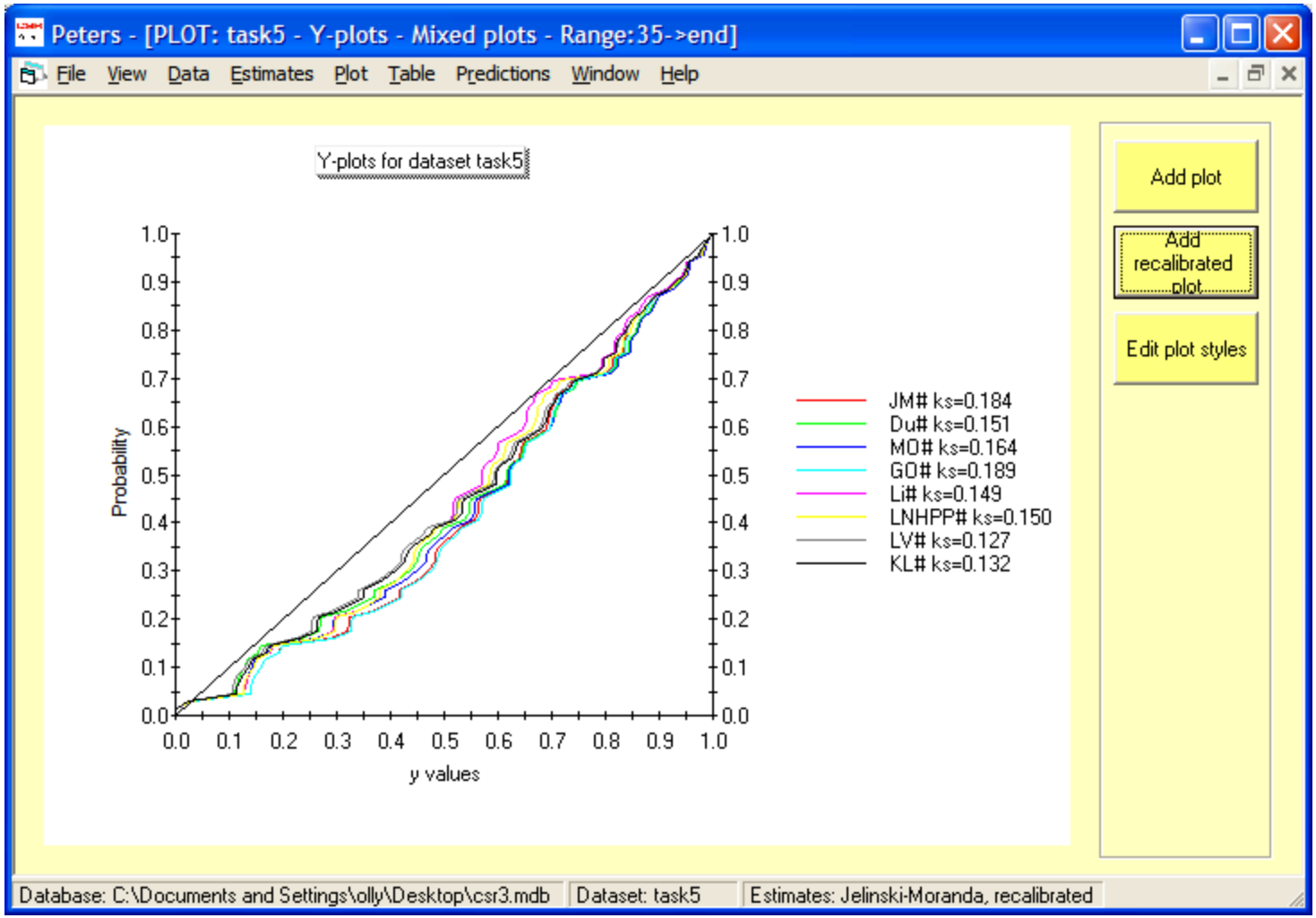
Dataset: task5
Estimates: Keiller-Littlewood, recalibrated

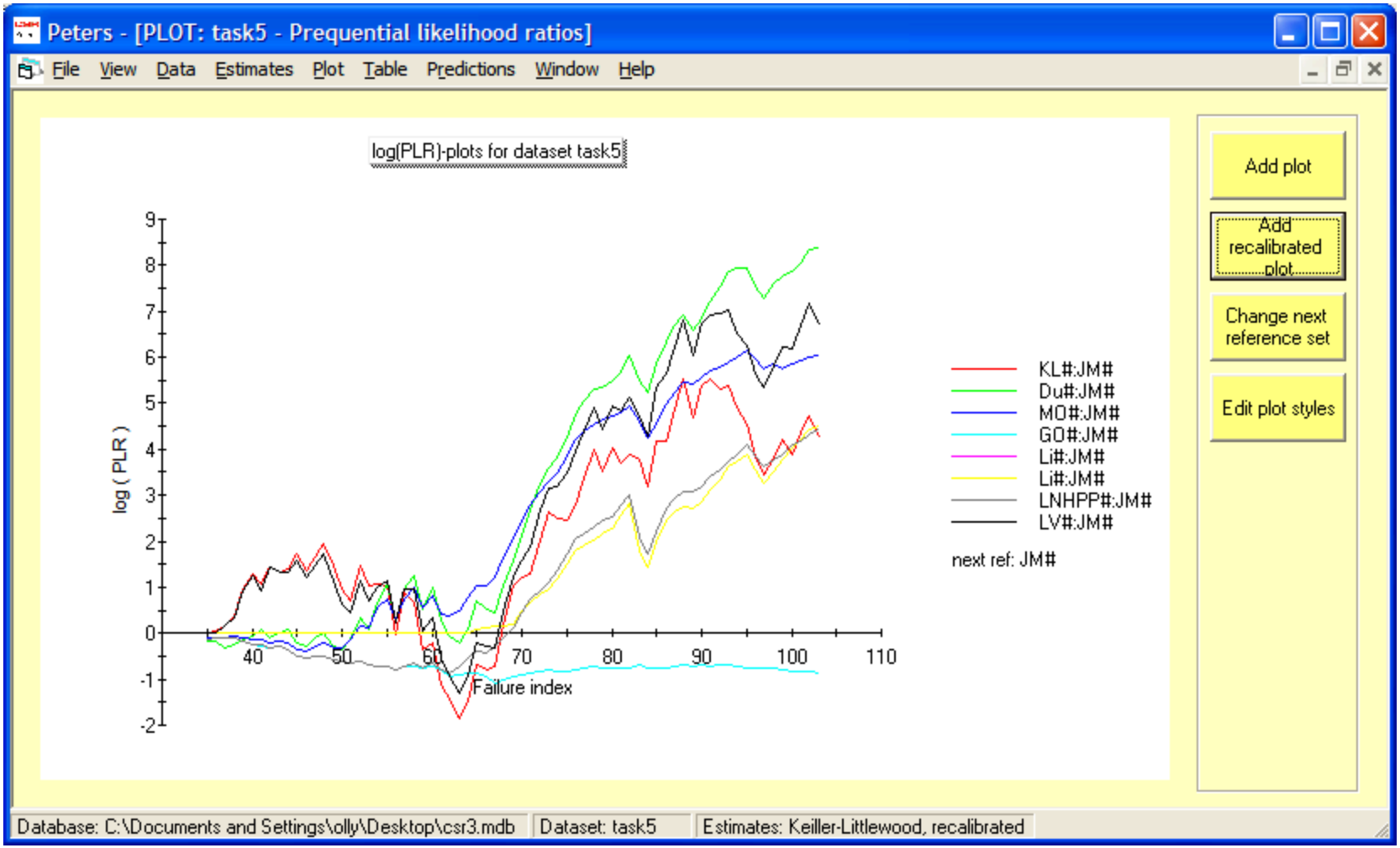
New u-plots


Peters - [PLOT: task5 - U-plots - Mixed plots - Range:35->end]
File View Data Estimates Plot Table Predictions Window Help
U-plots for dataset task5
Optimistic
Pessimistic
Probability
u values
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
JM# ks=0.166
Du# ks=0.071
MO# ks=0.119
GO# ks=0.166
Li# ks=0.123
LNHPP# ks=0.128
LV# ks=0.064
KL# ks=0.074
Add plot
Add recalibrated plot
Edit plot styles
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Jelinski-Moranda, recalibrated

New y-plots


Peters - [PLOT: task5 - Y-plots - Mixed plots - Range:35->end]
File View Data Estimates Plot Table Predictions Window Help
Y-plots for dataset task5
Probability
y values
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
JM# ks=0.184
Du# ks=0.151
MO# ks=0.164
GO# ks=0.189
Li# ks=0.149
LNHPP# ks=0.150
LV# ks=0.127
KL# ks=0.132
Add plot
Add recalibrated plot
Edit plot styles
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Jelinski-Moranda, recalibrated

New PLR plots



Prototype!

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Peters
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London, EC1V 0HB, UK
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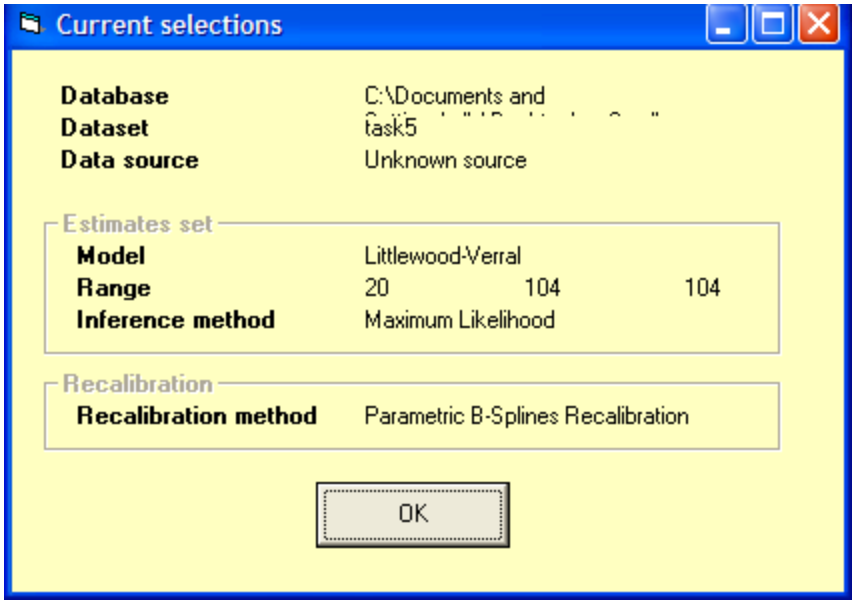
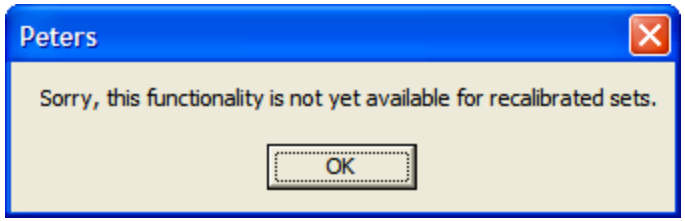
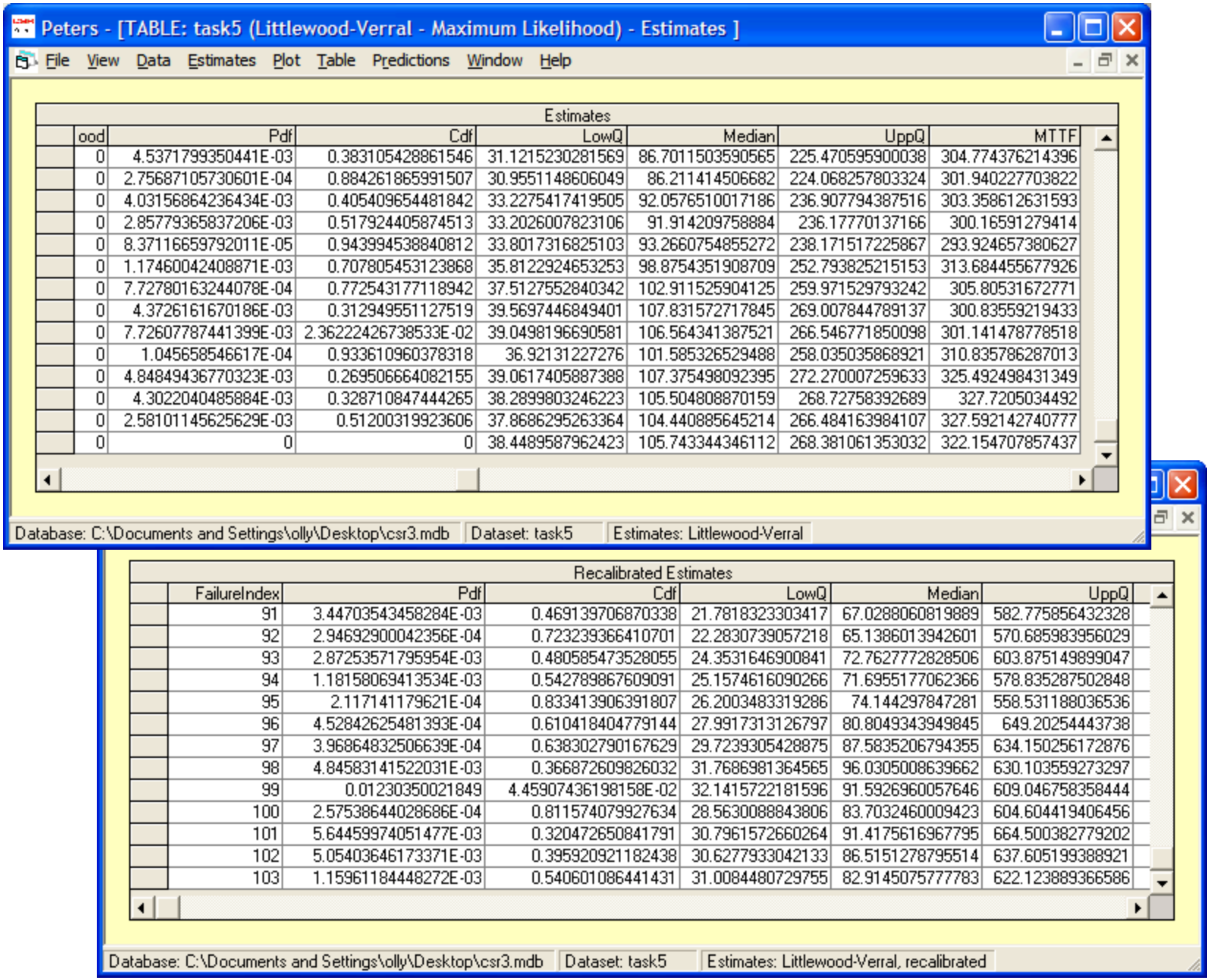
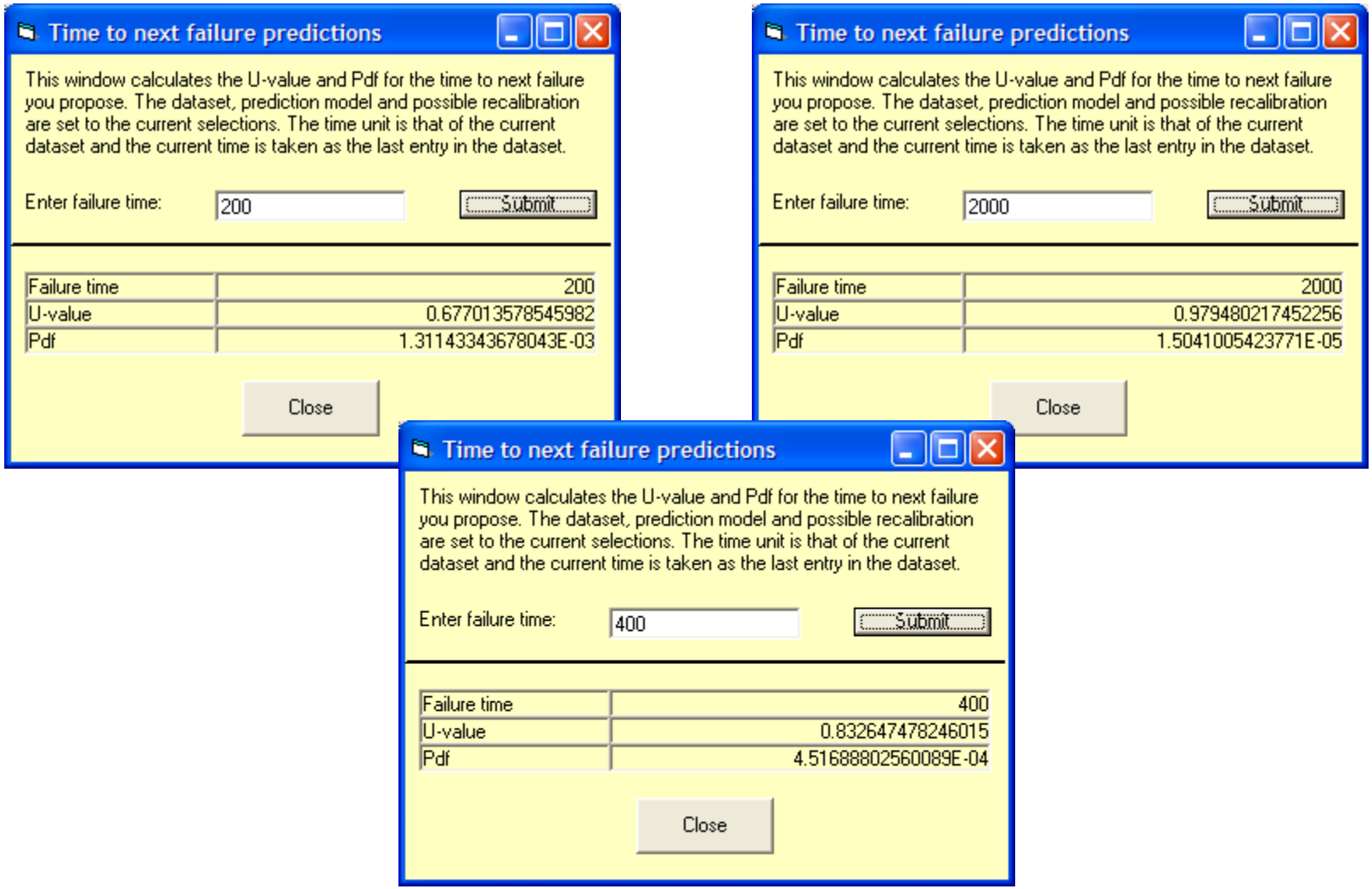
It is a research prototype which has not been
thoroughly tested. Please report bugs to:
PETERSproject@csr.city.ac.uk
OK


Current selections
Database
C:\Documents and
Dataset
task5
Data source
Unknown source
Estimates set
Model
Littlewood-Verral
Range
20
104
104
Inference method
Maximum Likelihood
Recalibration
Recalibration method
Parametric B-Splines Recalibration
OK


Peters
Sorry, this functionality is not yet available for recalibrated sets.
OK


Peters - [TABLE: task5 (Littlewood-Verral - Maximum Likelihood) - Estimates]
File View Data Estimates Plot Table Predictions Window Help
Estimates
ood Pdf Cdf LowQ Median UppQ MTTF
0 4.5371799350441E-03 0.383105428861546 31.1215230281569 86.7011503590565 225.470595900038 304.774376214396
0 2.75687105730601E-04 0.884261865991507 30.9551148606049 86.211414506682 224.068257803324 301.940227703822
0 4.031568642364 34E-03 0.405409654481842 33.2275417419505 92.0576510017186 236.907794387516 303.358612631593
0 2.85779365837206E-03 0.517924405874513 33.2026007823106 91.914209758884 236.17770137166 300.16591279414
0 8.37116659792011E-05 0.943994538840812 33.8017316825103 93.2660754855272 238.171517225867 293.924657380627
0 1.17460042408871E-03 0.707805453123868 35.8122924653253 98.8754351908709 252.793825215153 313.684455677926
0 7.72780163244078E-04 0.772543177118942 37.5127552840342 102.911525904125 259.971529793242 305.80531672771
0 4.3726161670186E-03 0.312949551127519 39.5697446849401 107.831572717845 269.007844789137 300.83559219433
0 7.72607787441399E-03 2.36222426738533E-02 39.0498196690581 106.564341387521 266.546771850098 301.141478778518
0 1.045658546617E-04 0.933610960378318 36.92131227276 101.585326529488 258.035035868921 310.835786287013
0 4.84849436770323E-03 0.269506664082155 39.0617405887388 107.375498092395 272.270007259633 325.492498431349
0 4.3022040485884E-03 0.328710847444265 38.2899803246223 105.504808870159 268.72758392689 327.7205034492
0 2.58101145625629E-03 0.51200319923606 37.8686295263364 104.440885645214 266.484163984107 327.592142740777
0 0 0 38.4489587962423 105.743344346112 268.381061353032 322.154707857437
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Littlewood-Verral
Recalibrated Estimates
FailureIndex Pdf Cdf LowQ Median UppQ
91 3.44703543458284E-03 0.469139706870338 21.7818323303417 67.0288060819889 582.775856432328
92 2.94692900042356E-04 0.723239366410701 22.2830739057218 65.1386013942601 570.685983956029
93 2.87253571795954E-03 0.480585473528055 24.3531646900841 72.7627772828506 603.875149899047
94 1.18158069413534E-03 0.542789867609091 25.1574616090266 71.6955177062366 578.835287502848
95 2.117141179621E-04 0.833413906391807 26.2003483319286 74.144297847281 558.531188036536
96 4.52842625481393E-04 0.610418404779144 27.9917313126797 80.8049343949845 649.20254443738
97 3.96864832506639E-04 0.638302790167629 29.7239305428875 87.5835206794355 634.150256172876
98 4.84583141522031E-03 0.366872609826032 31.7686981364565 96.0305008639662 630.103559273297
99 0.01230350021849 4.45907436198158E-02 32.1415722181596 91.5926960057646 609.046758358444
100 2.57538644028686E-04 0.811574079927634 28.5630088843806 83.7032460009423 604.604419406456
101 5.64459974051477E-03 0.320472650841791 30.7961572660264 91.4175616967795 664.500382779202
102 5.05403646173371E-03 0.395920921182438 30.6277933042133 86.5151278795514 637.605199388921
103 1.15961184448272E-03 0.540601086441431 31.0084480729755 82.9145075777783 622.123889366586
Database: C:\Documents and Settings\olly\Desktop\csr3.mdb
Dataset: task5
Estimates: Littlewood-Verral, recalibrated

Original LV - would look at new!



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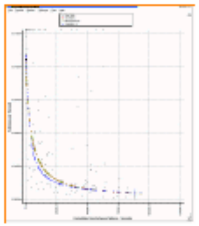


Moderators:
Allen Nikora

CASRE (Computer Aided Software Reliability Estimation) was developed as a software reliability measurement tool that is easier for nonspecialists in software reliability engineering to use than many other currently-available tools. CASRE incorporates the mathematical modeling capabilities of the public domain tool SMERFS (Statistical Modeling and Estimation of Reliability Functions for Software), and runs in a Microsoft Windows environment.

The command interface is menu driven; enabling and disabling of menu options guides users through the selection of a set of failure data, execution of a model, and analysis of model results. Input to the models is simultaneously displayed as text and as a high-resolution display that can be controlled to let users view the data in several different ways (e.g., time between successive failures, cumulative number of failures). Model predictions and statistical evaluations of a model's applicability (e.g., prequential likelihood ratio, model bias, bias trend) may be superimposed on the plot of the data used as input to the model. CASRE also incorporates earlier findings - that prediction accuracy may be increased by combining the results of several models in a linear fashion. Users can define their own model combinations, store them as part of the tool's configuration, and execute them in the same way as any other model.

What's new in Version 3.0?
Version 3.0 includes two trend tests that may be used to determine whether it is even appropriate to apply a

Internet

Times between Failures Data	Failure Counts Data
	Failure counts
	Test interval lengths
Failure Intensity	Failure Intensity
Times between failures	Times between failures
Cumulative number of failures	Cumulative number of failures
Cumulative number of failures from modeling start point	Cumulative number of failures from modeling start point
Reliability	Reliability

Table 1 – Available Plot Types

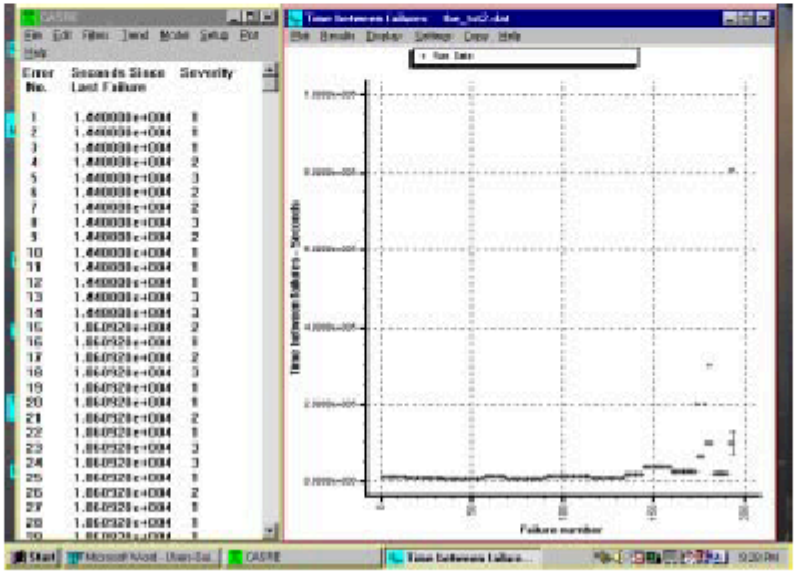


Figure 4 - Initial display for time between failures data - CASRE main window and graphic display window

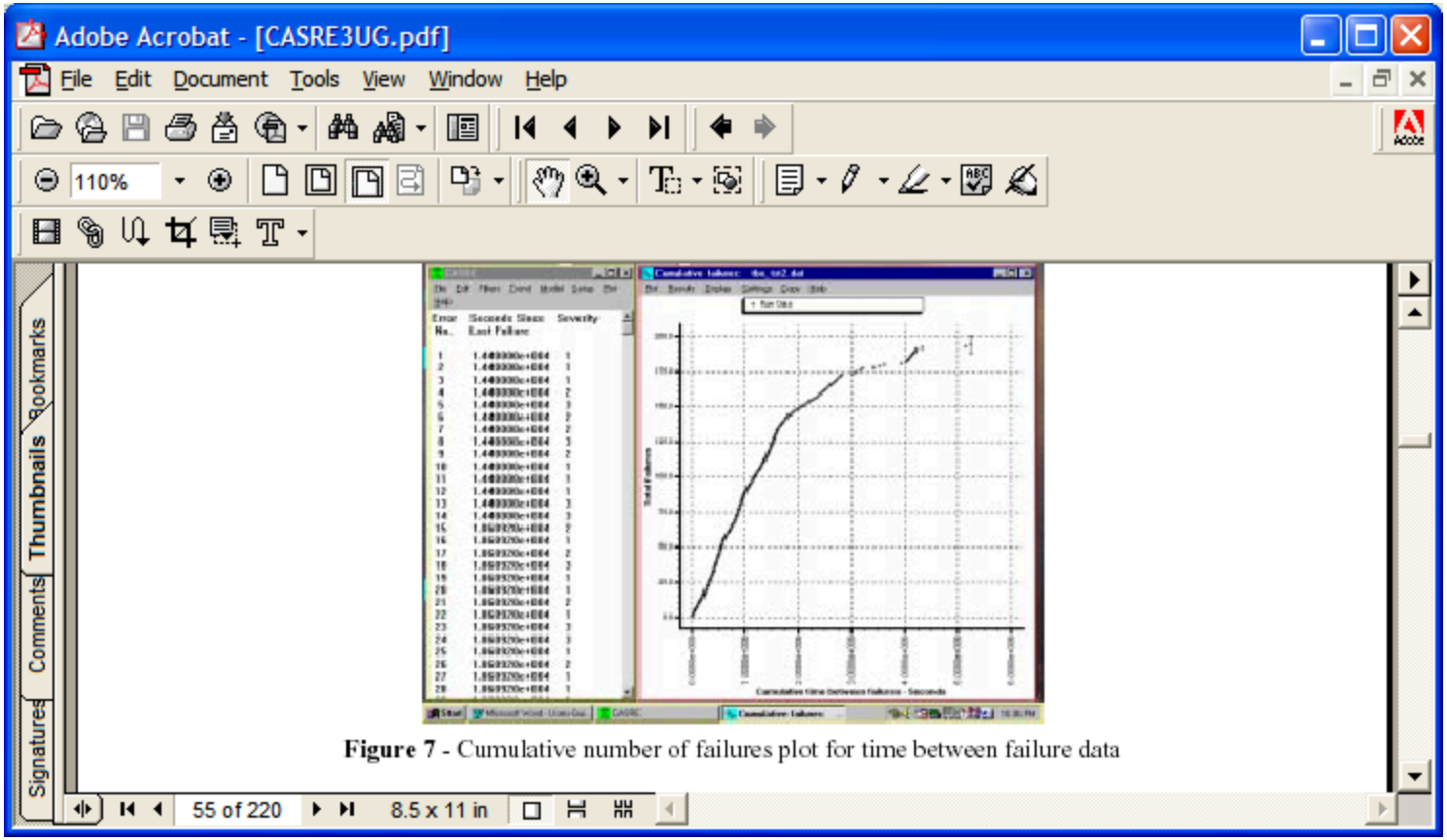


Figure 7 - Cumulative number of failures plot for time between failure data

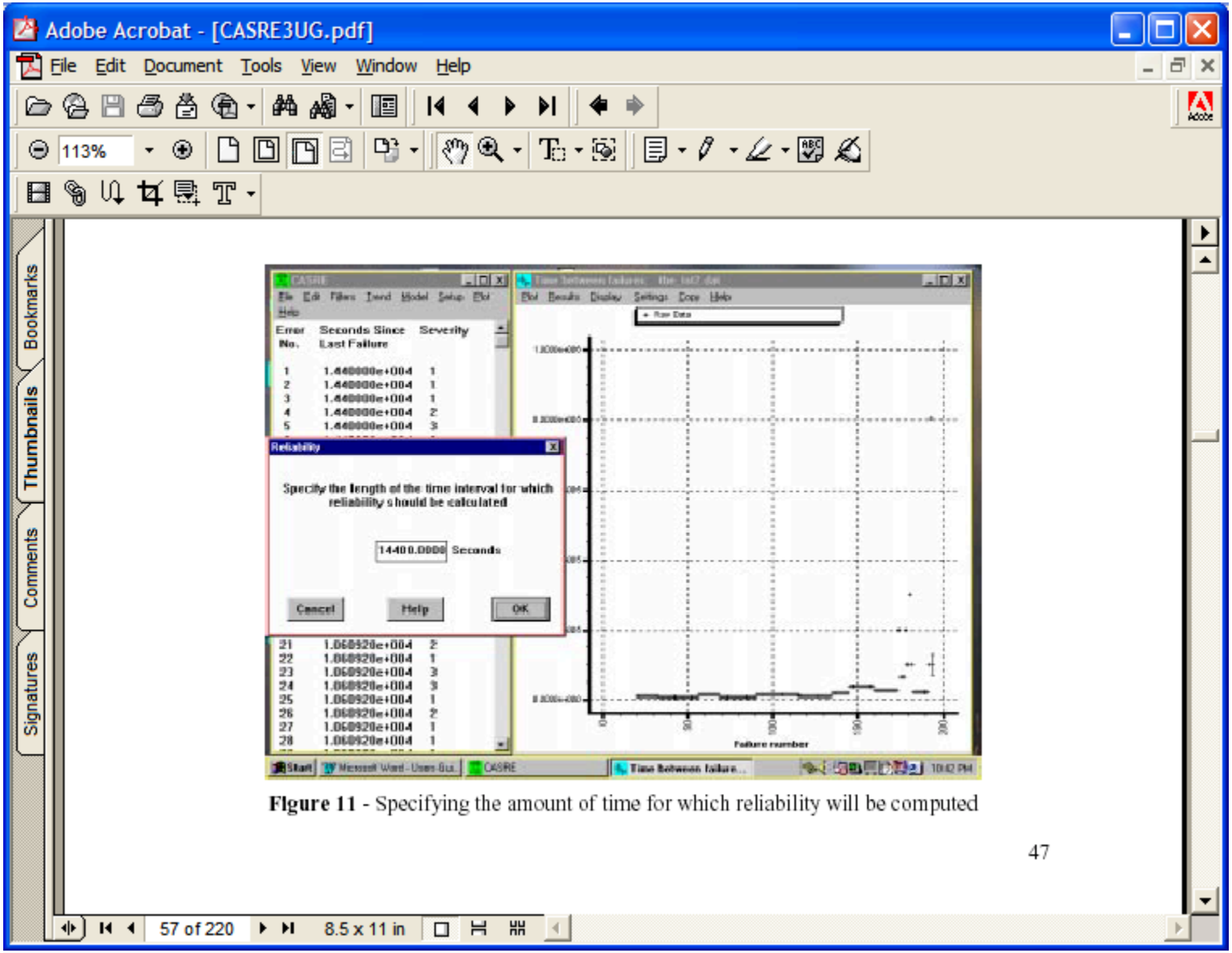


Figure 11 - Specifying the amount of time for which reliability will be computed

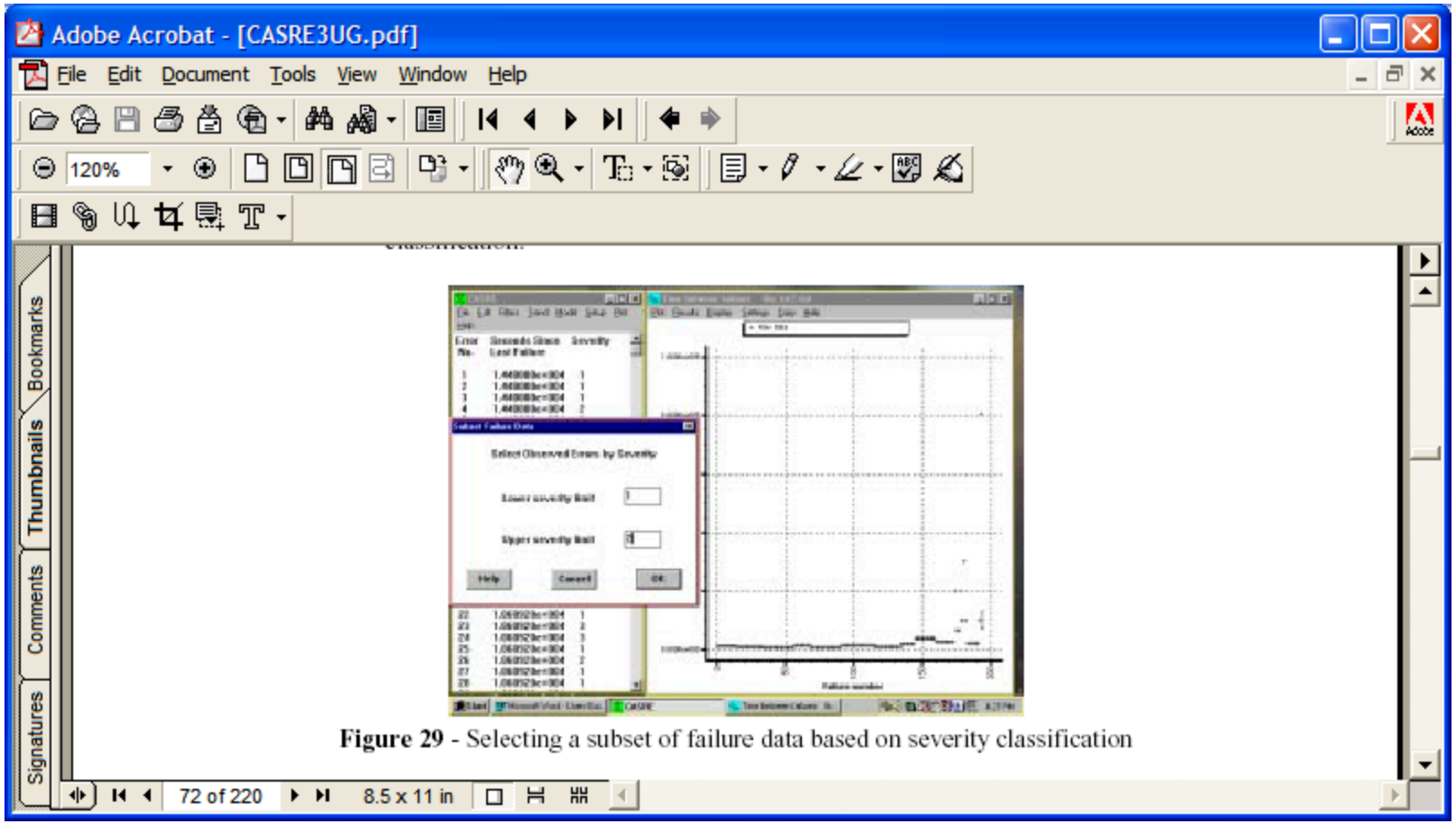
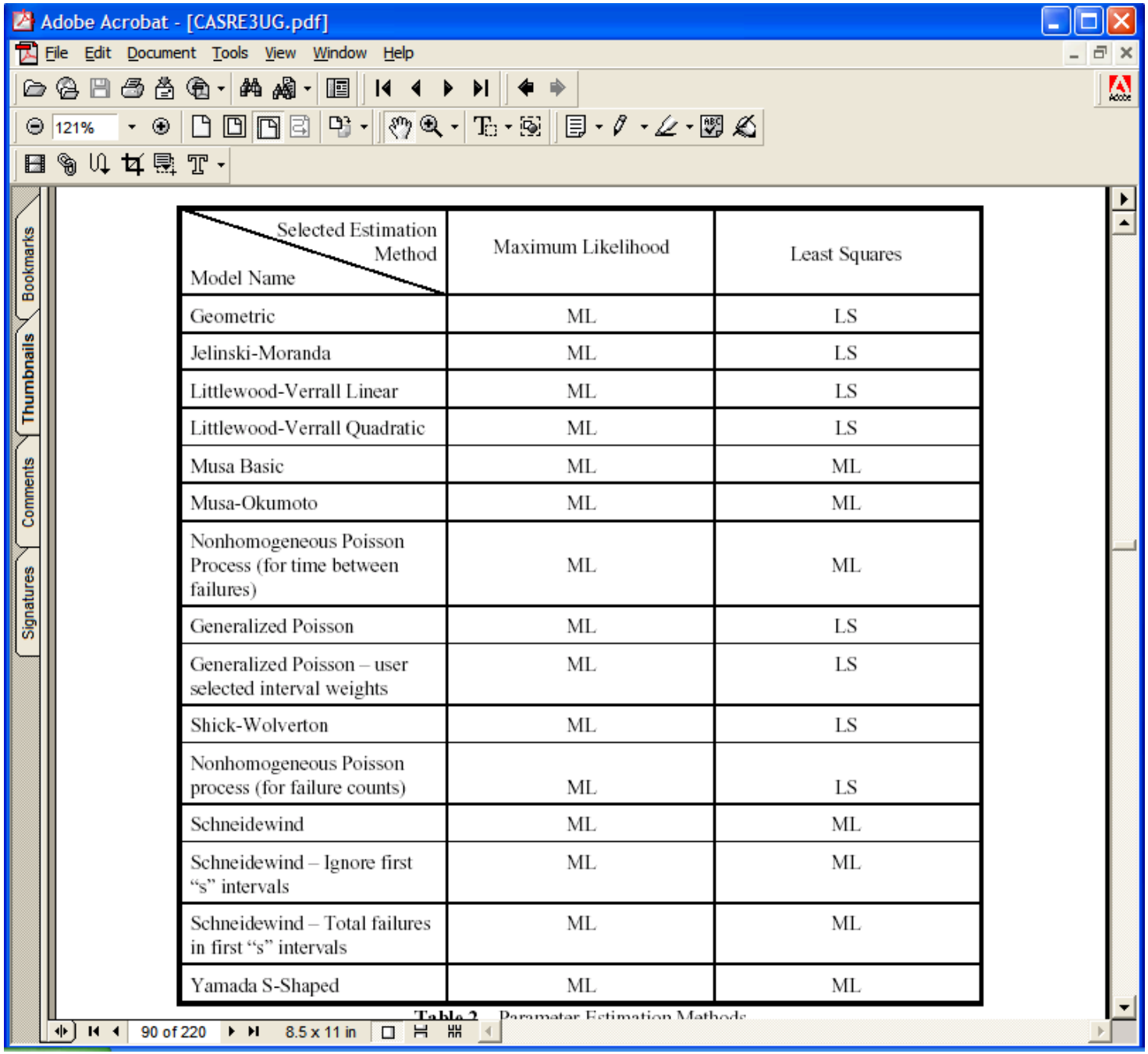


Figure 29 - Selecting a subset of failure data based on severity classification



Selected Estimation Method / Model Name	Maximum Likelihood	Least Squares
Geometric	ML	LS
Jelinski-Moranda	ML	LS
Littlewood-Verrall Linear	ML	LS
Littlewood-Verrall Quadratic	ML	LS
Musa Basic	ML	ML
Musa-Okumoto	ML	ML
Nonhomogeneous Poisson Process (for time between failures)	ML	ML
Generalized Poisson	ML	LS
Generalized Poisson – user selected interval weights	ML	LS
Shick-Wolverton	ML	LS
Nonhomogeneous Poisson process (for failure counts)	ML	LS
Schneidewind	ML	ML
Schneidewind – Ignore first "s" intervals	ML	ML
Schneidewind – Total failures in first "s" intervals	ML	ML
Yamada S-Shaped	ML	ML

Table 2 Parameter Estimation Methods

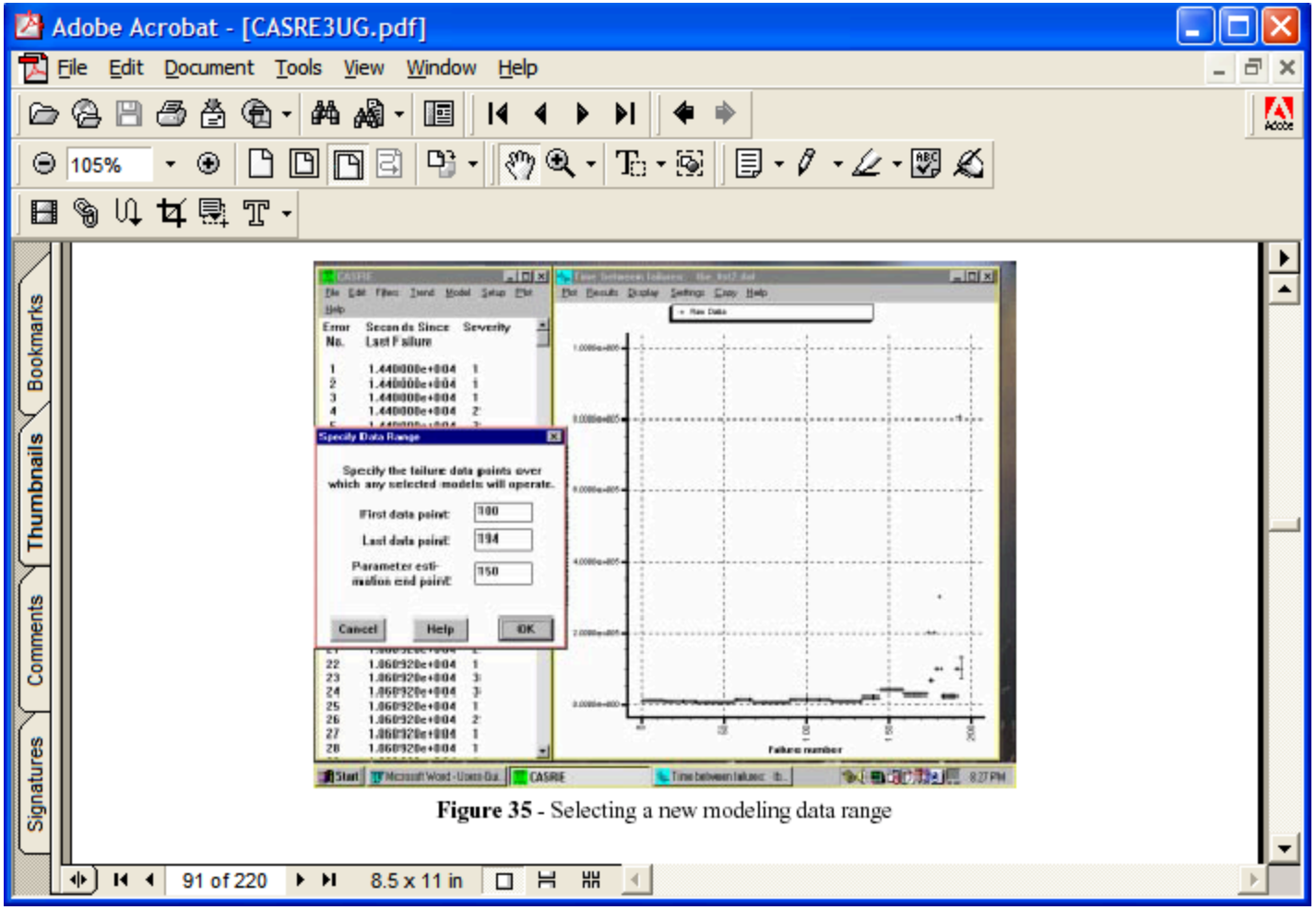


Figure 35 - Selecting a new modeling data range

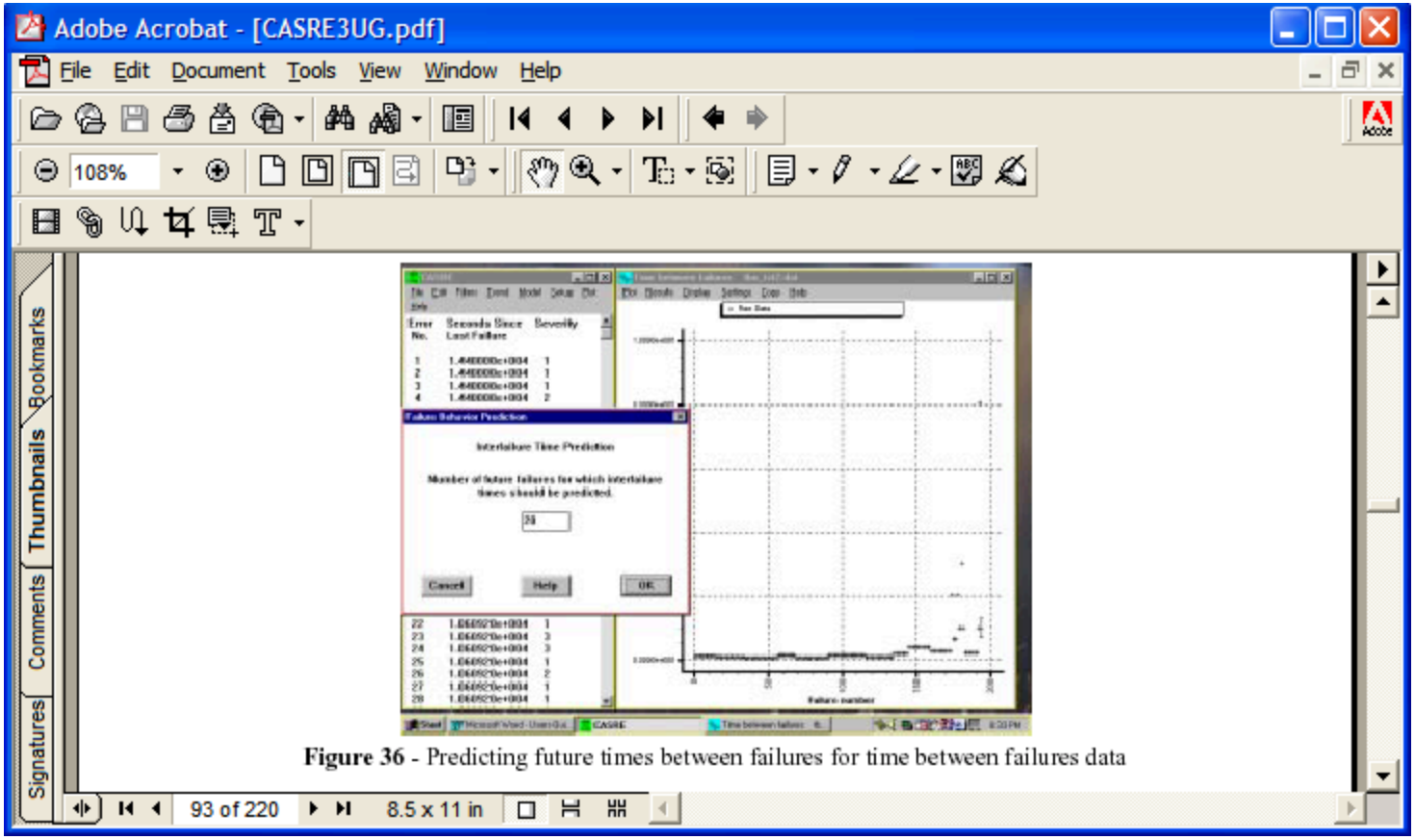


Figure 36 - Predicting future times between failures for time between failures data

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4.8.4. Selecting and Running Models

Now that the parameter estimation method, data range, and number steps into the future for which predictions should be made have been selected, we are ready to select and apply one or more models. Use the mouse to choose the "Select models..." item in the "Model" menu. This brings up the dialog box, shown in Figure 38 below, from which the models to be run are chosen.

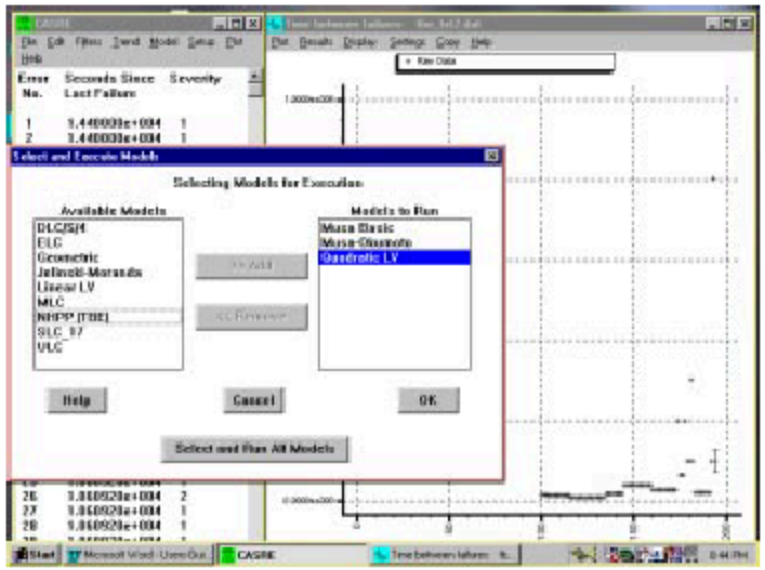


Figure 38 - Choosing models to run for time between failures data

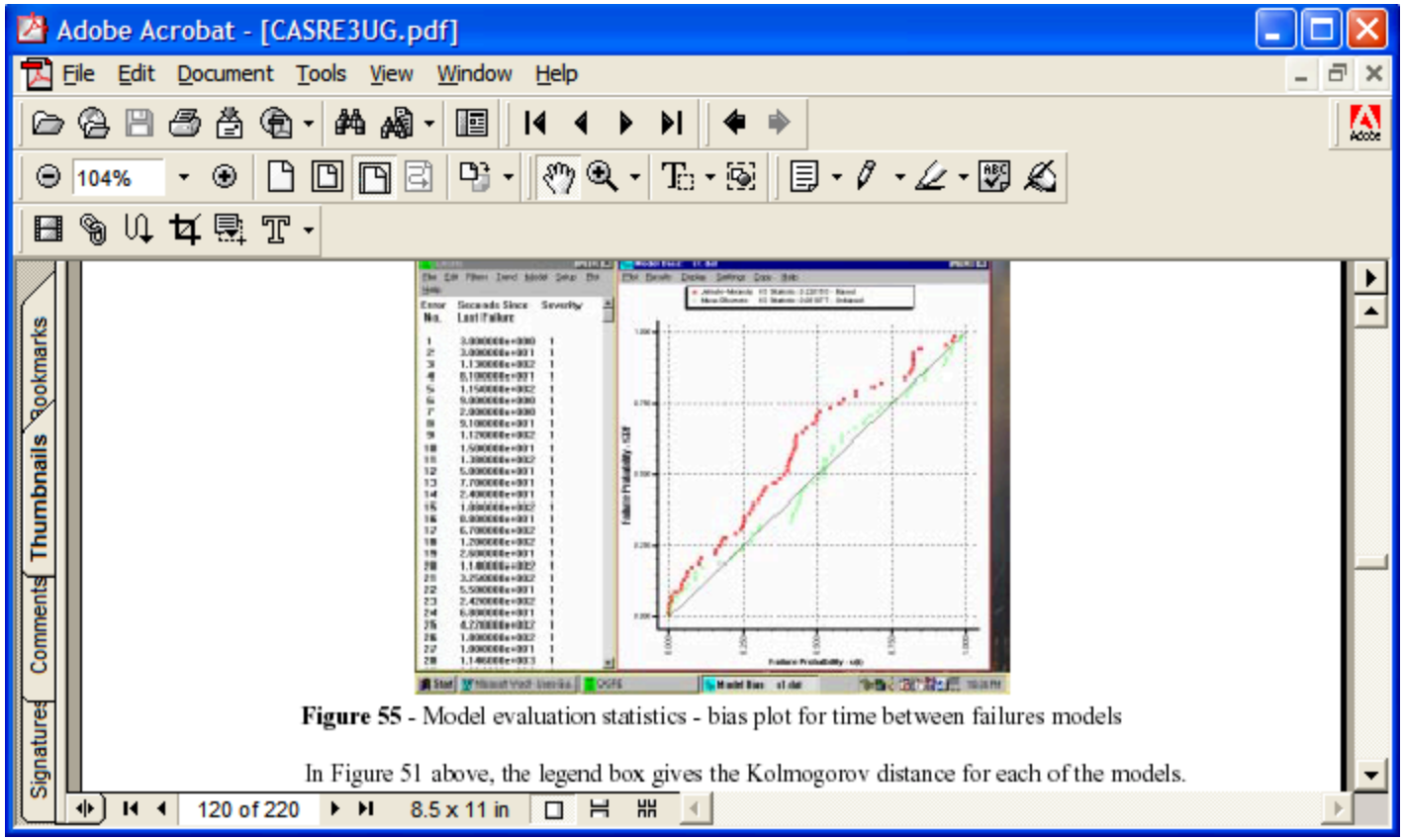


Figure 55 - Model evaluation statistics - bias plot for time between failures models

In Figure 51 above, the legend box gives the Kolmogorov distance for each of the models.

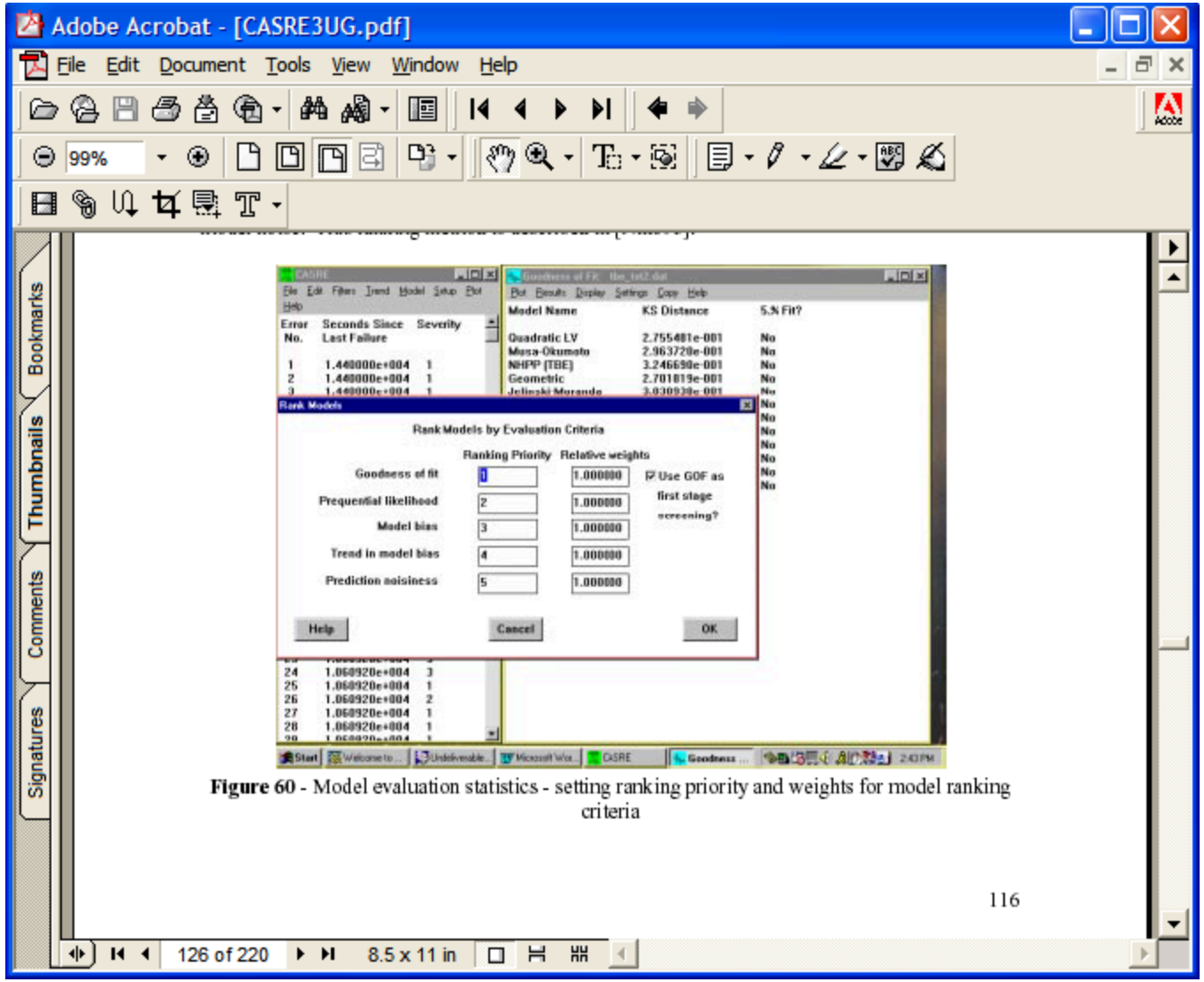


Figure 60 - Model evaluation statistics - setting ranking priority and weights for model ranking criteria

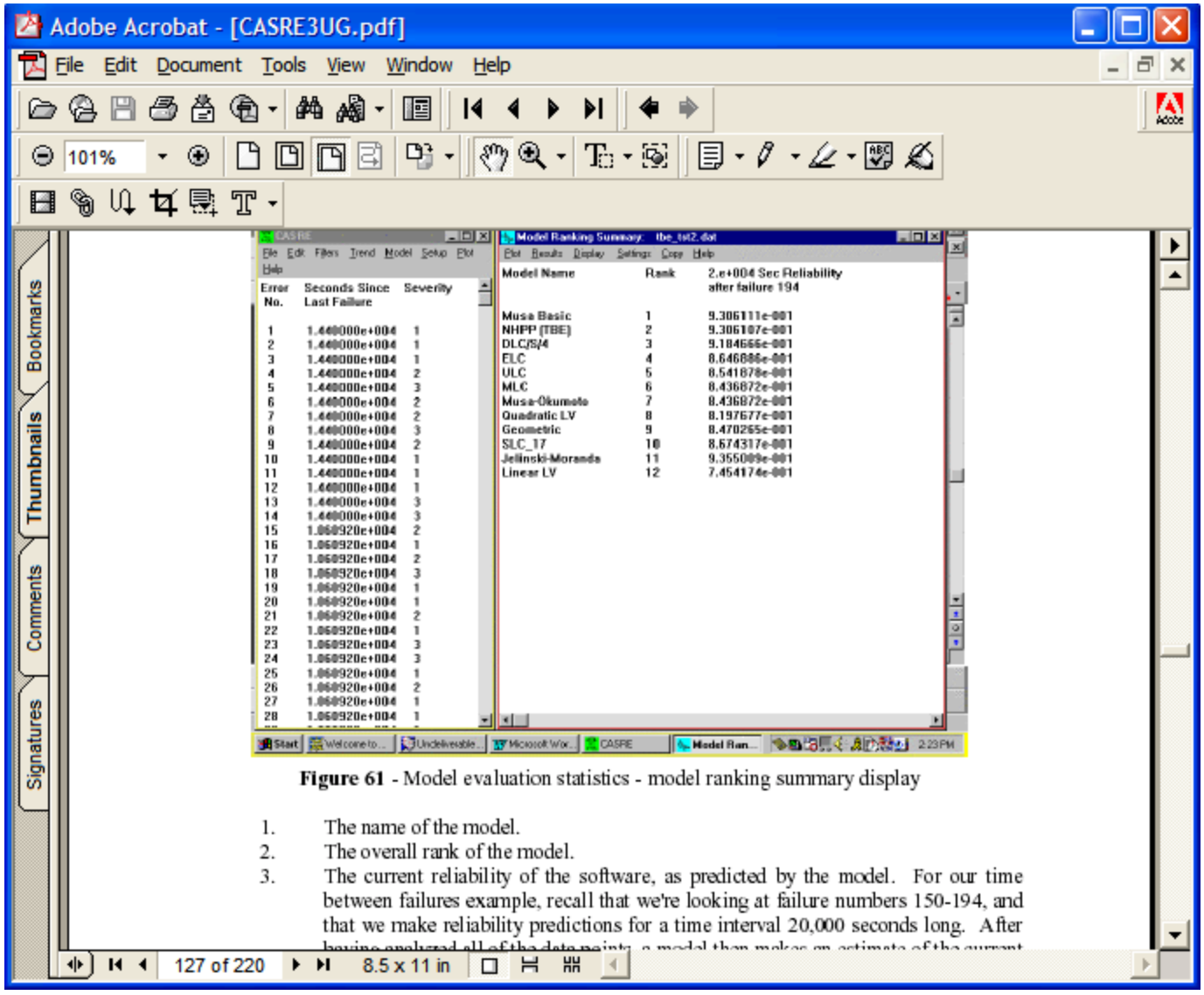
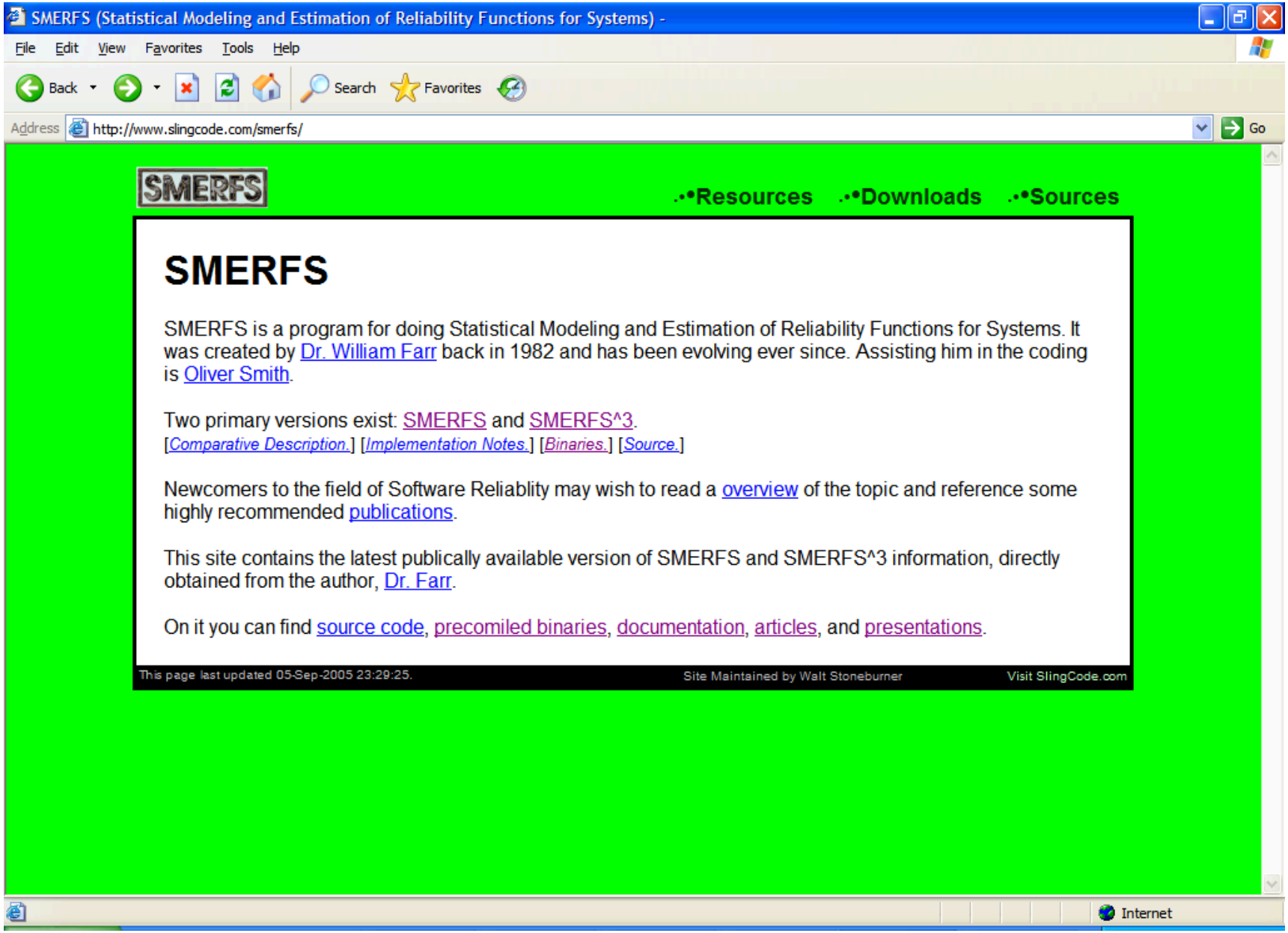


Figure 61 - Model evaluation statistics - model ranking summary display

1. The name of the model.
2. The overall rank of the model.
3. The current reliability of the software, as predicted by the model. For our time between failures example, recall that we're looking at failure numbers 150-194, and that we make reliability predictions for a time interval 20,000 seconds long. After having analyzed all of the data points, a model then makes an estimate of the current


SMERFS (Statistical Modeling and Estimation of Reliability Functions for Systems) -
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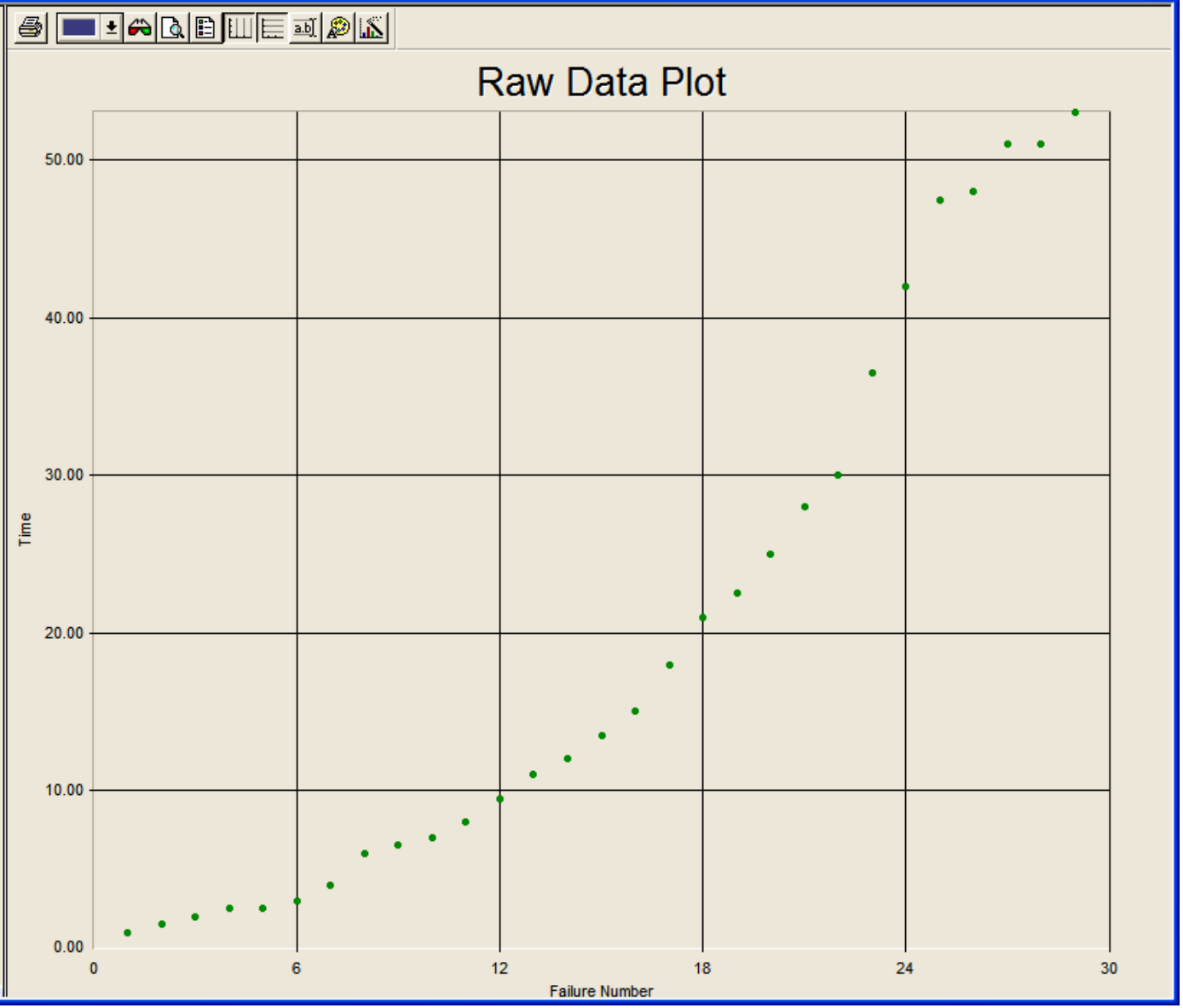
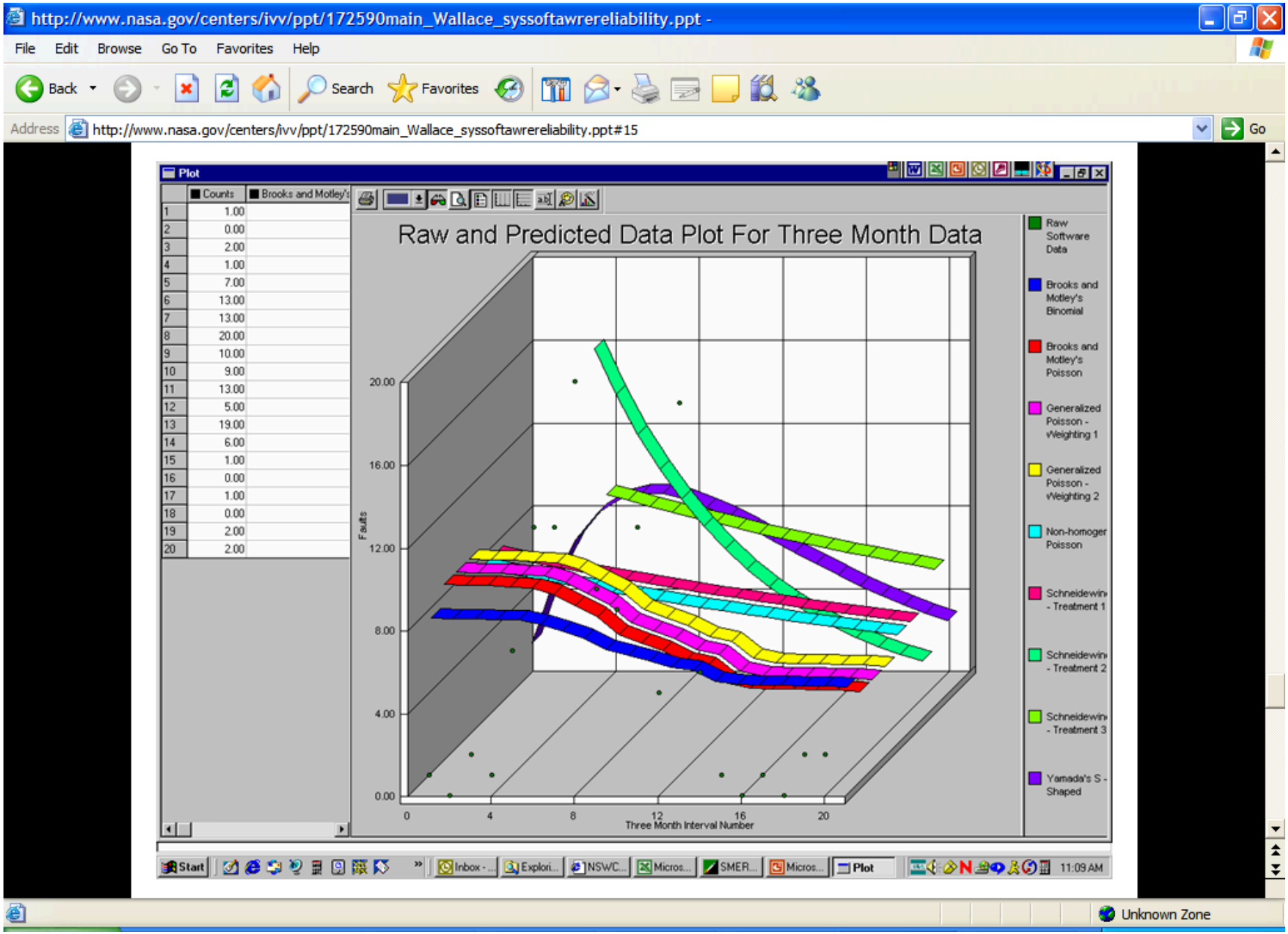
Address http://www.slingcode.com/smerfs/
Go
SMERFS
.•°Resources .•°Downloads .•°Sources
SMERFS
SMERFS is a program for doing Statistical Modeling and Estimation of Reliability Functions for Systems. It was created by Dr. William Farr back in 1982 and has been evolving ever since. Assisting him in the coding is Oliver Smith.
Two primary versions exist: SMERFS and SMERFS^3.
[Comparative Description.] [Implementation Notes.] [Binaries.] [Source.]
Newcomers to the field of Software Reliablity may wish to read a overview of the topic and reference some highly recommended publications.
This site contains the latest publically available version of SMERFS and SMERFS^3 information, directly obtained from the author, Dr. Farr.
On it you can find source code, precomiled binaries, documentation, articles, and presentations.
This page last updated 05-Sep-2005 23:29:25.
Site Maintained by Walt Stoneburner
Visit SlingCode.com
Internet

Plot

	TBF Units	Failure Type
1	1.00	0.00
2	1.50	0.00
3	2.00	0.00
4	2.50	0.00
5	2.50	0.00
6	3.00	0.00
7	4.00	0.00
8	6.00	0.00
9	6.50	0.00
10	7.00	0.00
11	8.00	0.00
12	9.50	0.00
13	11.00	0.00
14	12.00	0.00
15	13.50	0.00
16	15.00	0.00
17	18.00	0.00
18	21.00	0.00
19	22.50	0.00
20	25.00	0.00
21	28.00	0.00
22	30.00	0.00
23	36.50	0.00
24	42.00	0.00
25	47.50	0.00
26	48.00	0.00
27	51.00	0.00
28	51.00	0.00
29	53.00	0.00

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Go
Plot
Counts
Brooks and Motley's
1 1.00
2 0.00
3 2.00
4 1.00
5 7.00
6 13.00
7 13.00
8 20.00
9 10.00
10 9.00
11 13.00
12 5.00
13 19.00
14 6.00
15 1.00
16 0.00
17 1.00
18 0.00
19 2.00
20 2.00
Raw and Predicted Data Plot For Three Month Data
Faults
0.00
4.00
8.00
12.00
16.00
20.00
0
4
8
12
16
20
Three Month Interval Number
Raw Software Data
Brooks and Motley's Binomial
Brooks and Motley's Poisson
Generalized Poisson - Weighting 1
Generalized Poisson - Weighting 2
Non-homoger Poisson
Schneidewin - Treatment 1
Schneidewin - Treatment 2
Schneidewin - Treatment 3
Yamada's S - Shaped
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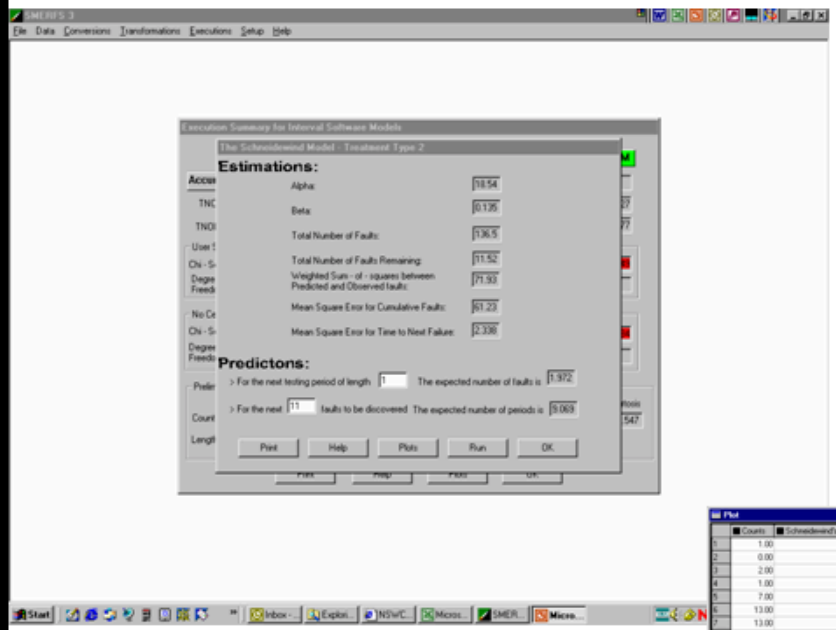
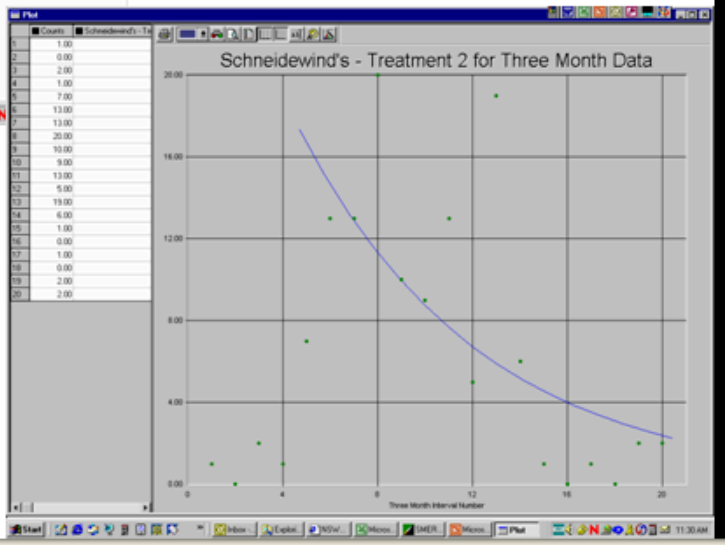


Data Analysis of NASA Three Month Fault Counts



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Caveat

- This is a starting point!
- It is about awareness raising and signposting
- The rest is up to you!